The Future is Now!

Opportunities for Home Energy Management Systems (HEMS) in Advancing Residential Energy Efficiency Programs

Presented by:

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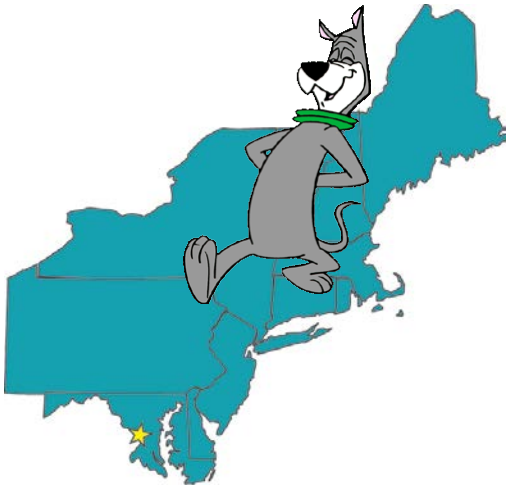
Tuesday, September 15th, 3pm

Note: This webinar is being recorded

About NEEP

Mission

Accelerate energy efficiency as an essential part of demand-side solutions that enable a sustainable regional energy system



Approach

Overcome barriers and transform markets via

Collaboration, Education and Enterprise

Vision

Region embraces **next generation energy efficiency** as a core strategy to meet energy needs in a carbon-constrained world

One of six regional energy efficiency organizations (REEOs) funded by the US Department of Energy (US DOE) to link regions to US DOE guidance, products and programs

About CLEAResult

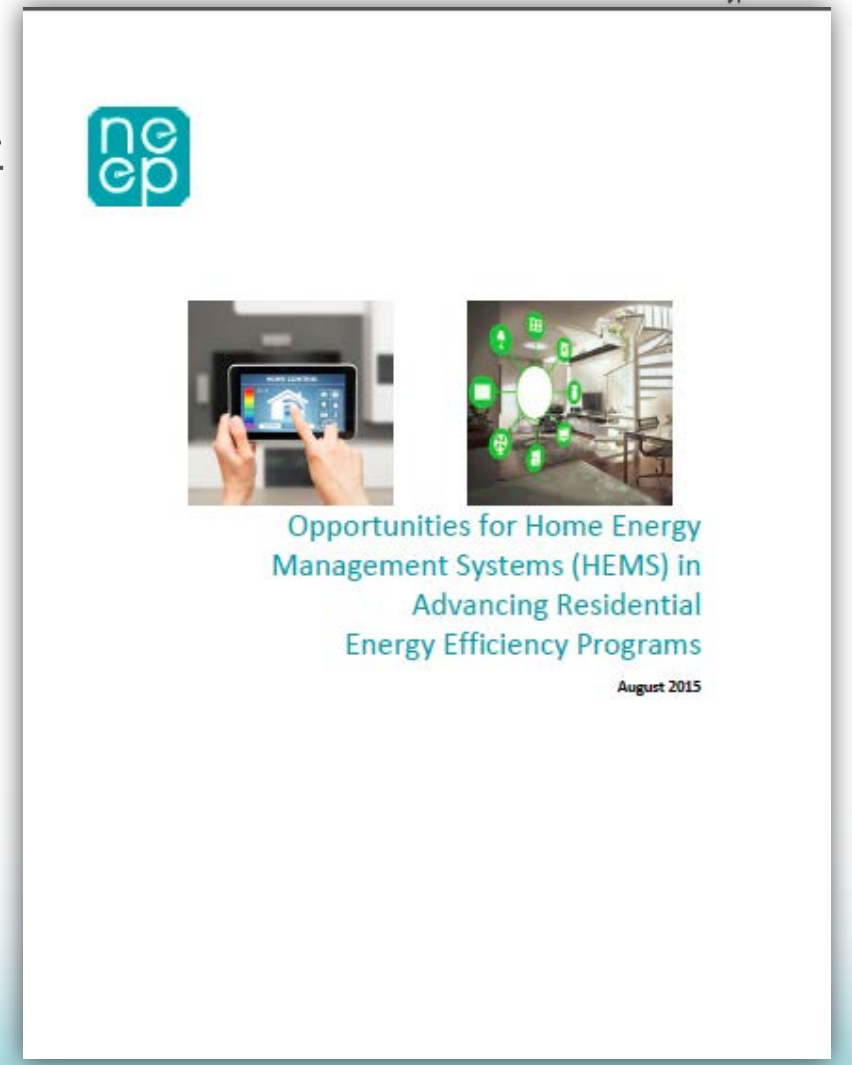
- CLEAResult helps utilities, businesses and individuals make the wise use of energy a way of life.
- Headquartered in Austin, Texas, with offices in more than 40 cities in the U.S. and Canada, CLEAResult designs, markets and implements energy programs around the globe.
- Our experienced energy experts tailor strategies to our clients' specific needs and circumstances.
- With over 400 people, the Portland office is the largest site in the company, and it is the homebase of the CLEAResult HEMS Research Team.

The Report!

- Available at:

http://neep.org/initiatives/high-efficiency-products/home-energy-management-systems

- Direct link here



Sections

Executive Summary

1. Introduction
2. Technology Assessment
3. Program Activity Assessment
4. HEMS in Policy
5. Potential of HEMS as an M&V Tool

6. Opportunity Assessment

7. Recommendations

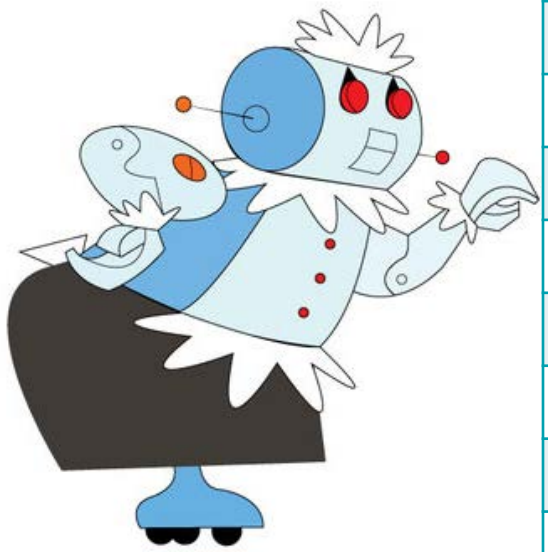
Appendices

Executive Summary

- Start your journey here
- This outlines the report to help figure out what you want to learn more about
- Sets up the background, walks through the details, and presents opportunities
- Recommendation: Start here and **share** the Executive Summary

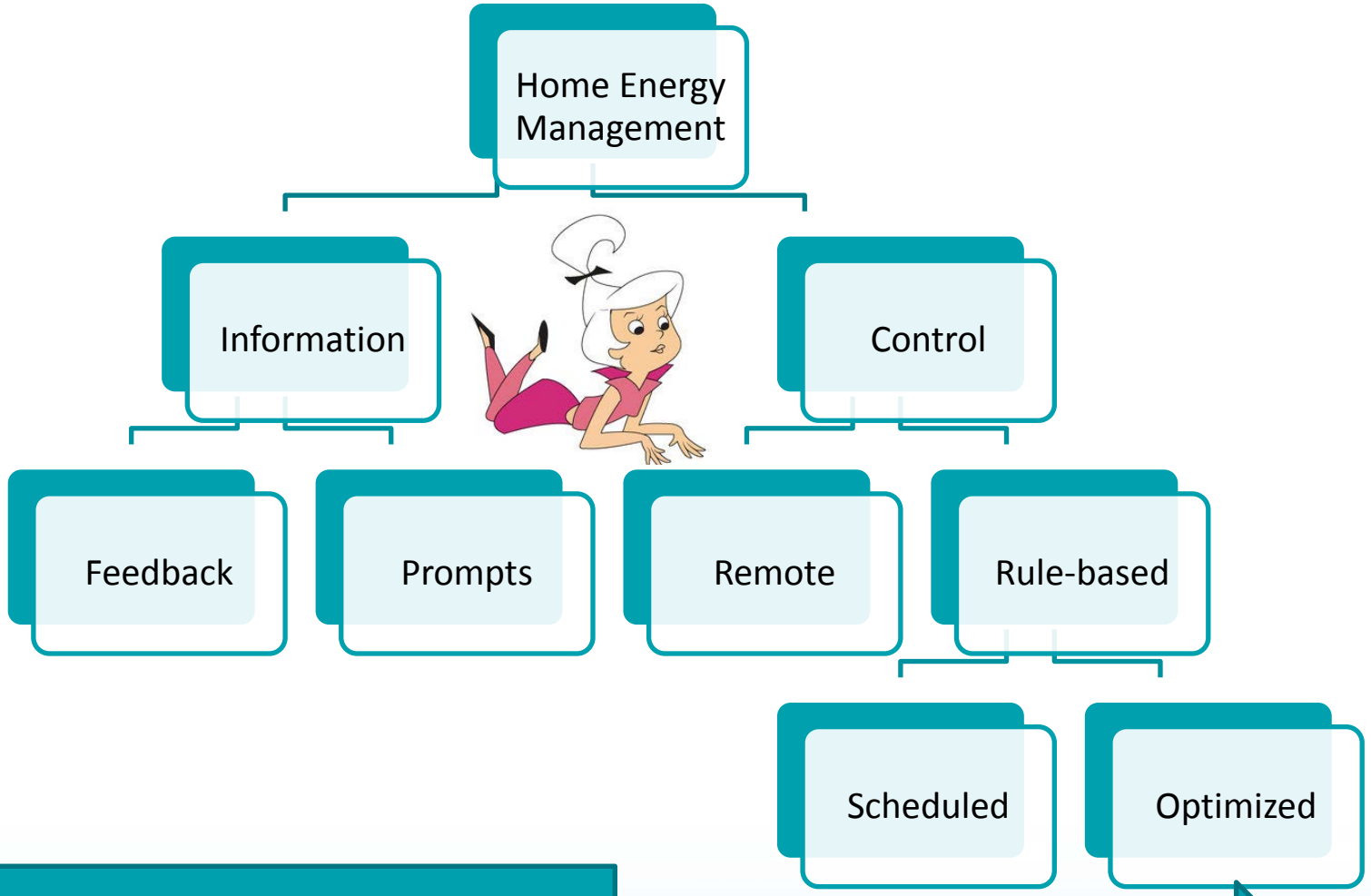
Technology Assessment

- At press time, had the following:



Category	# in Each Category
Smart Lighting	12
Smart Plug	48
Smart Hub	14
Smart Switch	3
Smart Appliance	9
Smart Thermostat	16
Energy Portal	46
Data Analytics Platform	15
In-Home Display	38
Load Monitor	18
Smart Home Platform	23
Web Service Platform	2
Total	244

Information vs. Control HEMS



Technology Assessment

- Updatable, downloadable, sortable list available online at:

http://neep.org/initiatives/high-efficiency-products/home-energy-management-systems

As part of the HEMS Research Report, NEEP reviewed and updated inventories of HEMS technology from existing resources, while expanding the inventory lists and providing costs and potential linkages where appropriate. The inventory chart below is the technology assessment from the HEMS Research Report.

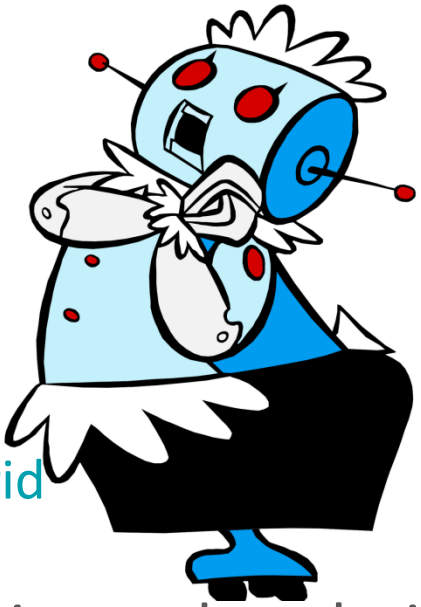
Download Spreadsheet

HEMS Technology Assessment

HEMS Technology Assessment			
Company	**Product**	**Description**	**Product Category**
1B First Build	Chill hub Smart refrigerator control	Chill Hub Smart refrigerator and smart refrigerator control hub	Smart Appliance
Aclara	Customer Care Solutions	Unique content and analytics that improve the effectiveness of customer care and billing, enhances customer energy management and increases customer satisfaction by helping customers better understand and manage their bills	Energy Portal
ADT	ADT Pulse	The ADT Pulse® portal provides secure access so you can monitor and manage your home's energ and security via most web-enabled devices.	Smart Home Platform
Aeon Labs Aeotec	DSB09104-ZWUS	Z-Wave Smart Energy Meter , uses CT clamps to monitor power and relay it back to z-wave hub	Energy Portal
Aeon Labs Aeotec	DSC06106-ZWUS	Z-Wave Smart Energy Switch	Smart Plug
Aeon Labs Aeotec	DSC24-ZWUS	Smart Switch Z-Wave Appliance Module	Smart Plug
Aeon Labs Aeotec	DSC11-ZWUS	Z-Wave Smart Energy Power Strip	Smart Plug

Opportunity Assessment

- Took information about the programs and technologies from the previous sections, sliced and diced to find the true opportunities
- Analyzed Opportunities by:
  - End Use
  - Regional Considerations
  - Delivery Channel
  - Dwelling Type
  - Behavior and Consumer Engagement
  - Resources and Applications of Smart Grid
  - Program M&V
- Included *savings estimates for planning* and analysis of *opportunities at scale*



Opportunity by End Uses

Table 7: HEMS Program Type, Channel, and Dwelling Type

Program Type	Channel	Dwelling Type	Products Available for Programs
DIY / Customer Self-install	Retail / Big-Box	Existing Single Family (SF), Existing Mobile Home (MH)	Smart Lighting, Plugs, Hubs, Switches, Appliances, Thermostats; Smart Home Platforms; Load Monitors
	Online e-Commerce Portal	Existing SF, Existing MH	Smart Lighting, Plugs, Hubs, Switches, Appliances, Thermostats; Smart Home Platforms; Load Monitors; In-home Display
Licensed Contractor / Qualified Installer	Builder	New SF, New Multi Family (MF)	Smart Lighting, Appliances, Thermostats; Smart Home Platform; Energy Portal; In-home Display
	Manufacturer	New MH	Smart Lighting, Appliances, Thermostats; Smart Home Platform; Energy Portal; In-home Display
	Home Performance Contractor / Trade Ally	Existing SF, Existing MF, Existing MH, Low Income	Smart Appliances, Thermostats; Smart Home Platform; Energy Portal; In-home Display
In-Home Service Providers	Cable / Internet Service Providers	New SF, New MF, Existing SF, Existing MF, Existing MH	Smart Plugs, Hubs, Switches; Smart Home Platform; Load Monitors
	Security System Providers	New SF, New MF, Existing SF, Existing MF, Existing MH	Smart Lighting, Plugs, Hubs, Switches; Smart Home Platform; Load Monitors; In-home Display
Utility Direct to Customer / Mail	On-bill Financing / Payment	Existing SF, Existing MF, Existing MH, Low Income	Energy Portal; Data Analytics Platform; Web Service Platform

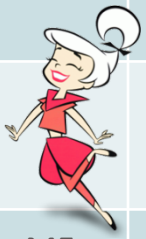


Table 8: Opportunity by Resource

Resource	Information-based	Control-based
Energy Efficiency	Provide feedback about energy use to customers Providing info on rewards, incentives, additional actions, and other EE program measures	Providing options for controlling energy-using products or systems by customers
Auto Demand Response	Informing customers of an impending DR event	Provides direct load control of energy-using products or systems by program administrators
Behavioral Demand Response (BDR)	Informing customers of a change in energy rate (time of use pricing - TOU) Asking customers to reduce use; making suggestions about how to reduce use Asking customers to opt-in to next DR event	
Load Shifting / Energy Balancing	Pertains to Electric programs Inform customers of renewable energy production	Automatically shift home energy consumption from grid draw to solar PV draw when the sun is shining and PV array is in full production
Energy Storage	Informing customers of how much electricity they have “stored” in batteries	Shifting to stored energy in case of power outage/emergency (grid resilience) Allowing grid to draw on energy stored in batteries or thermally

Also ran analysis for GHG Emissions/Labeling and Water

M&V Opportunities

Types of HEMS M&V

- behavioral/operational savings stemming solely from the occupants' interaction with information-based HEMS
- savings that stems from automation algorithms built into control-based HEMS
- savings from any additional retrofits motivated by the feedback provided by the HEMS to the occupants

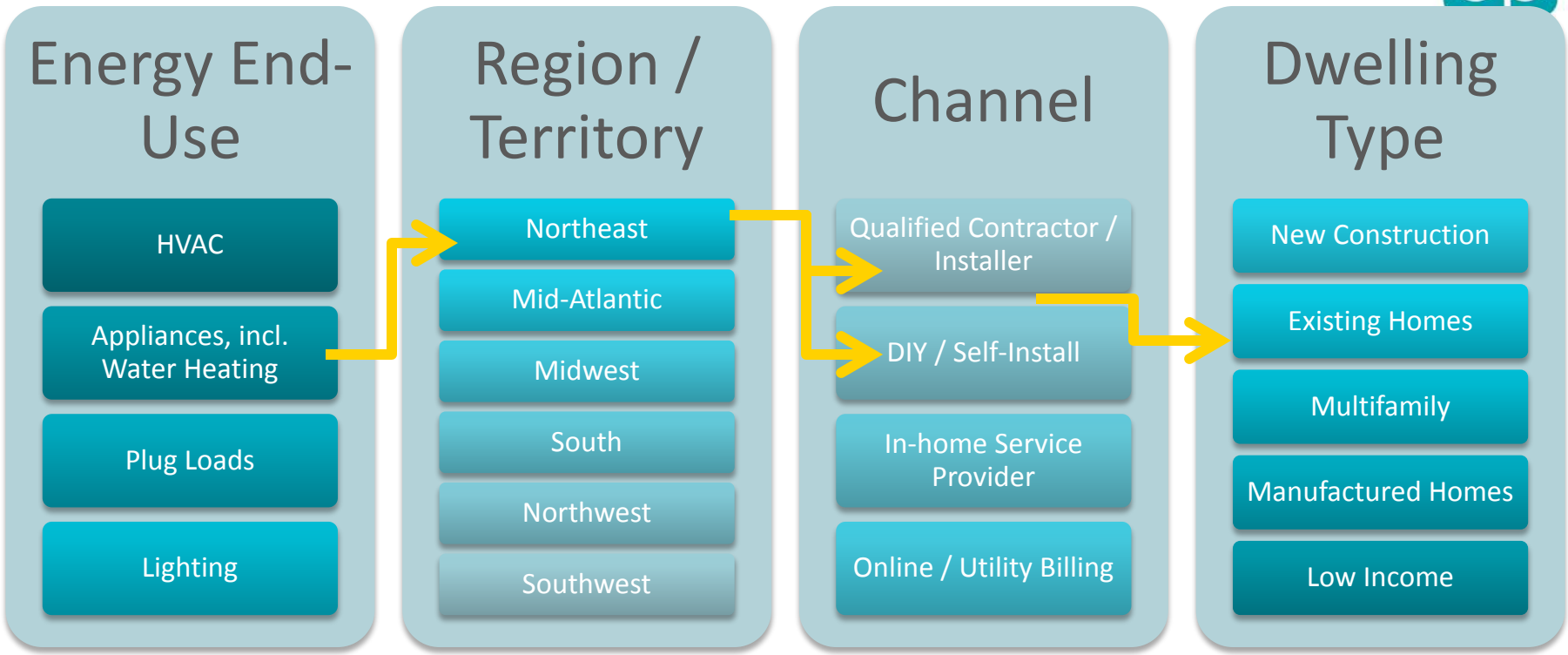
- HEMS that capture home energy usage at interval-data frequency can be run through M&V algorithms to potentially measure savings in near-real-time
  - Could help verify savings from retrofits or from widgets

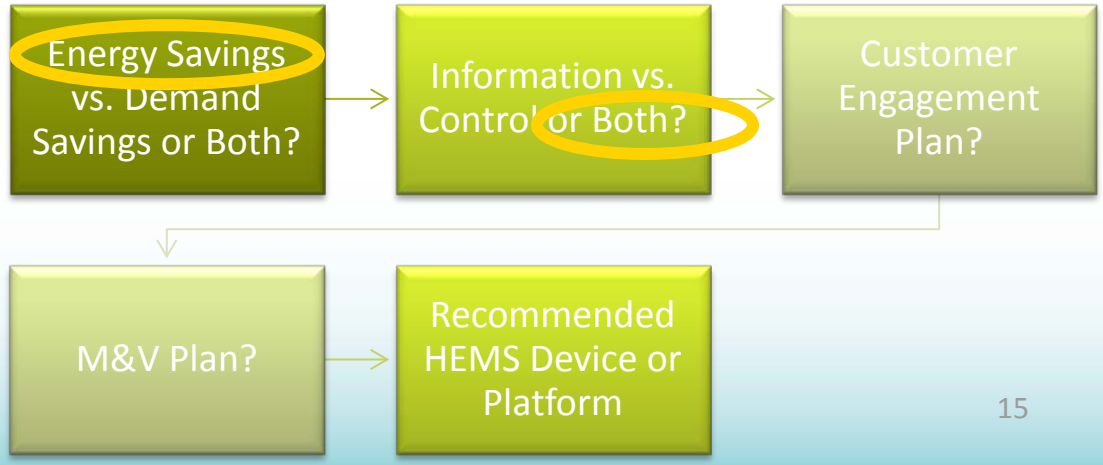
Conclusions and Recommendations

Information-Based HEMS Savings Estimates by End-Use							
Products	End-Use	Savings Range (whole home energy usage as baseline)			Cost Range		
		Low	Avg.	High	Low	Avg.	High
Customer-Facing Energy Portal / In-home Display / Load Monitor	Space Heating	1%	8%	15%	$20	$197	$4000
	Space Cooling	1%	5%	9%			
	Water Heating	1%	8%	15%			
	Appliances	<1%	1%	1%			
	Plug Loads	<1%	2%	3%			
	Lighting	<1%	2%	3%			

- Program Design Framework
- Also offer specific recommendations for *further research* and *new program strategies*
- Hypotheticals

Planning Process for Programs with HEMS





Conclusion

- HEMS present a very wide array of efficiency program opportunities for the Northeast and Mid-Atlantic
- Versatile:
  - Can work in nearly every type of dwelling
  - Can work in every region/climate in the country
  - Can address nearly every household system
  - Can manage energy loads as well as peak demand, renewable generation, and energy storage
    - HEMS as “Air Traffic Controller for DER”
- *Can be the tool to evolve residential efficiency programs*

Next Steps

- Further research and analysis required
- Is there a regional research opportunity?
- HEMS Working Group meeting bi-monthly
- Audience Questions

THANK YOU!

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Have a great day!