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February 3, 2015

MEMORANDUM

TO: Power Committee

FROM: Charlie Grist, Tina Jayaweera, Kevin Smit

SUBJECT: Draft Conservation Supply Curve

BACKGROUND:

Presenter: Charlie Grist, Tina Jayaweera, Kevin Smit

Summary: Staff will summarize the discussions from the January Conservation Resources Advisory Committee (CRAC) meetings, including updates on issues presented at the December Power Committee meeting and proposed ramp rates.

Staff will then provide an overview of the key drivers of the changes in conservation potential since the completion of the Sixth Power Plan's assessment. These drivers include:

- Conservation accomplishments
- New and revised state energy codes and federal standards
- Load forecast revisions
- Updated assessments of stock and market characteristics
- New conservation opportunities
- Updated measure savings

Staff will provide preliminary results, overall and by sector, and describe specific examples of how these drivers are affecting the sector's conservation potential relative to the Sixth Plan. We will also include a list of measures considered by sector.

Overall, staff's preliminary estimate of remaining conservation potential has decreased from the Sixth Plan, primarily due to slower underlying

regional load growth, the impact of new efficiency standards and utility program achievements. However, significant potential remains.

Relevance: This presentation provides the Power Committee a preview of the draft results that will be presented to the full Council during the March meeting.

Workplan: 1D. Prepare for Seventh Power Plan and maintain analytical capability; update conservation supply curves.

Background: During the January 2015 Power Committee meeting, staff discussed the key policy issues raised to-date with the CRAC. Two of those issues were discussed further at CRAC meetings held later in January. In addition, the draft load forecast was presented at the December 2014 Power Committee meeting. The draft results and other drivers for the conservation supply curves have not been previously discussed with the Council for the Seventh Plan.

More Info: CRAC meeting notes and comments from stakeholders are available on the CRAC webpage: <http://www.nwcouncil.org/energy/crac/home/>

Conservation Resources

Power Committee
February 10, 2015

Key Drivers of Remaining Conservation

- **Amount**
 - Total MWh of savings
- **Pace**
 - Year by year maximum acquisition amount
- **Cost**
 - Total resource cost (by \$/kWh bin)

Focus of today's presentation

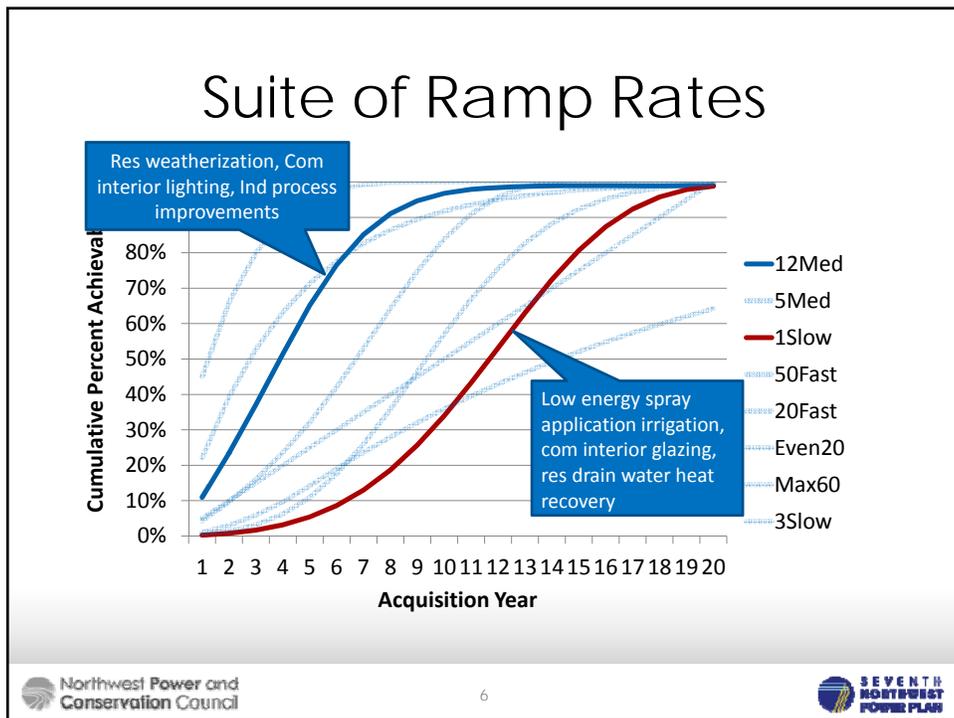
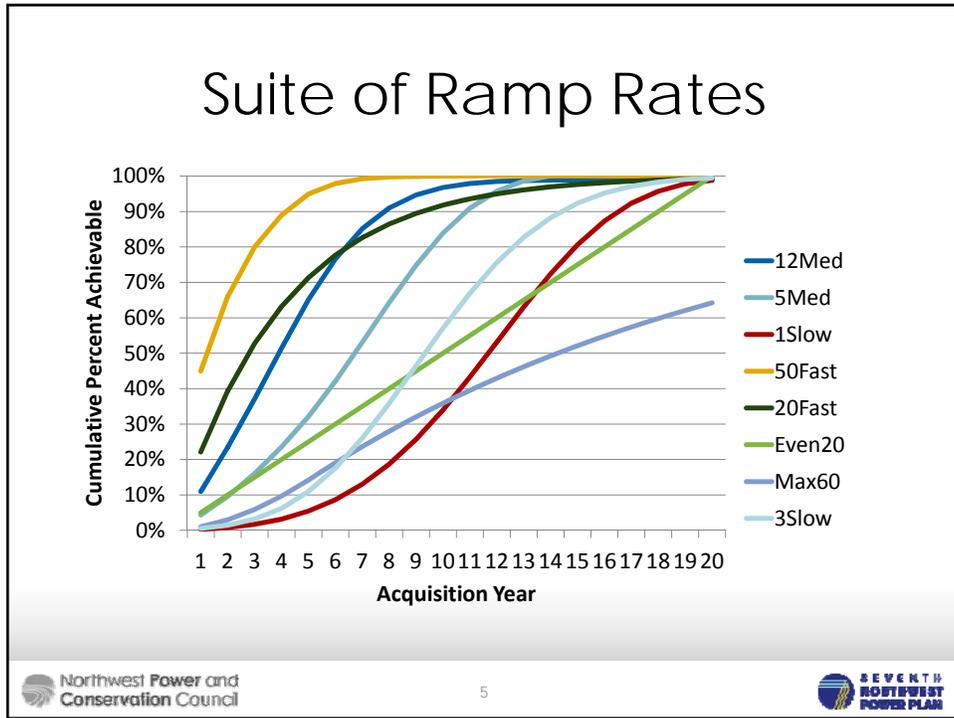


Status

- **Recent discussions with CRAC**
 - Residential lighting approach with short-term “PPA-like” savings: OK
 - Residential behavior/control optimization program: OK, though didn’t like name
 - Ramp rates: generally OK, some adjustments
- **Compiling results**
 - Some workbooks available now for review
- **Draft results in March for RPM inputs**

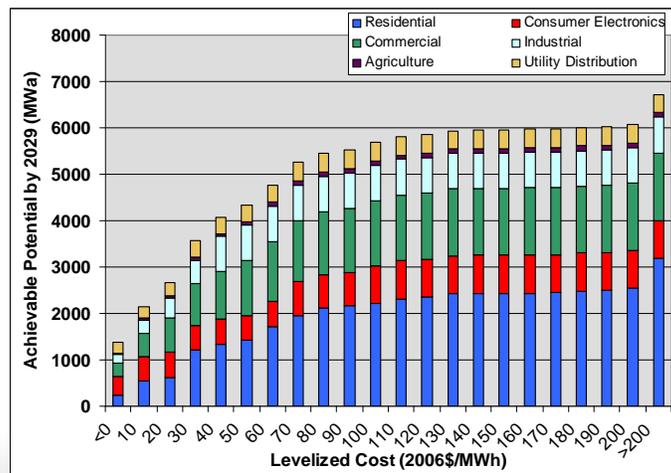
Ramp Rates

- Used to determine maximum pace of acquisition in conjunction with annual unit count
- Now based on acquisition year
 - Depends on when cost bundle is selected
 - *Not* equal to plan year
- For 7P, aligned retrofit and lost opportunity to single set of eight curves
- Achievability fraction (85%) applied on top of ramp rate



COMPARING WITH 6TH PLAN

6P Supply Curve



Overview of Drivers

Relative to the 6th Plan Conservation Potential :





Decreases due to:

- Conservation accomplishments
- New and revised state energy codes and federal standards
- Lower Load forecast
- Culled measures

Increases due to:

- New measures
- Higher units counts for some measures

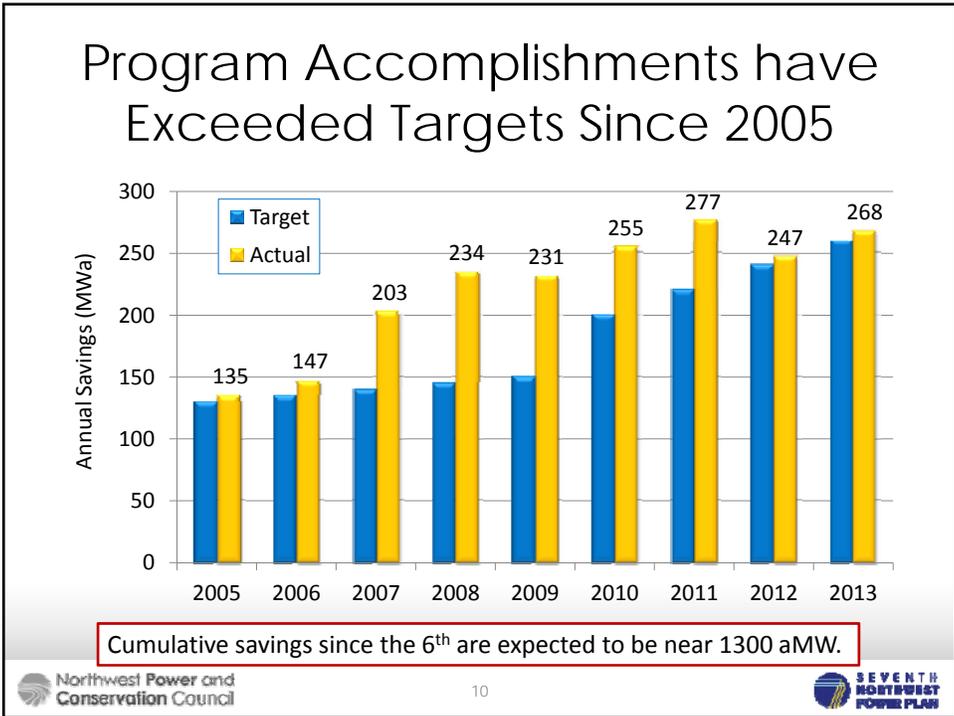


- Updated assessments of stock and market characteristics

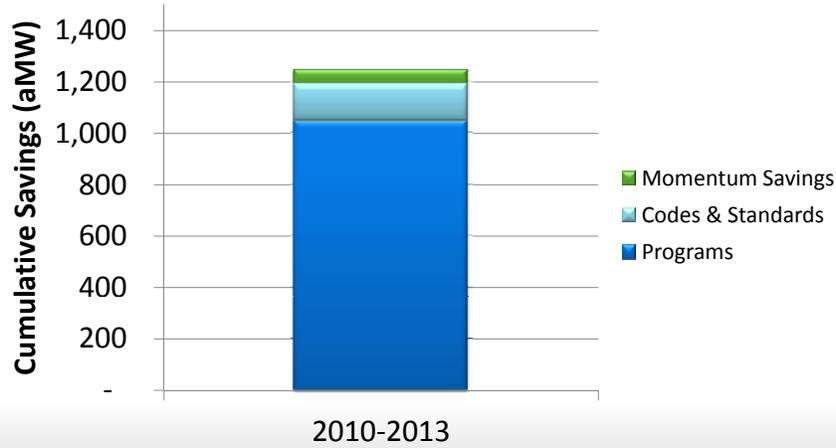


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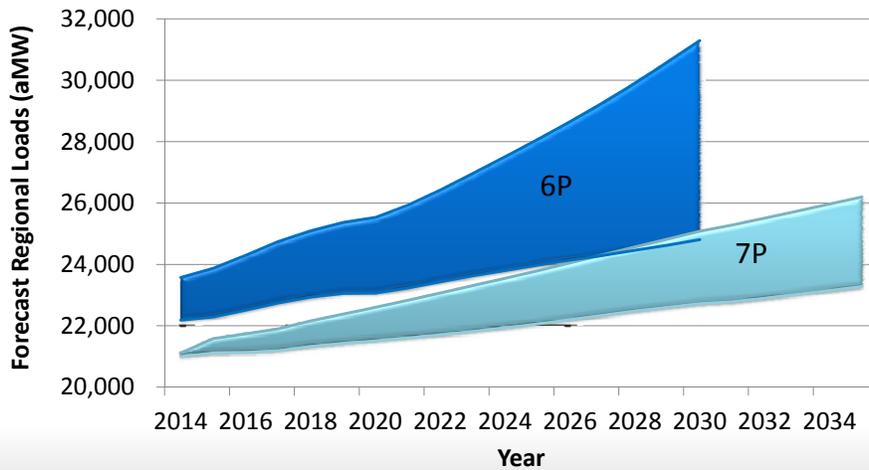




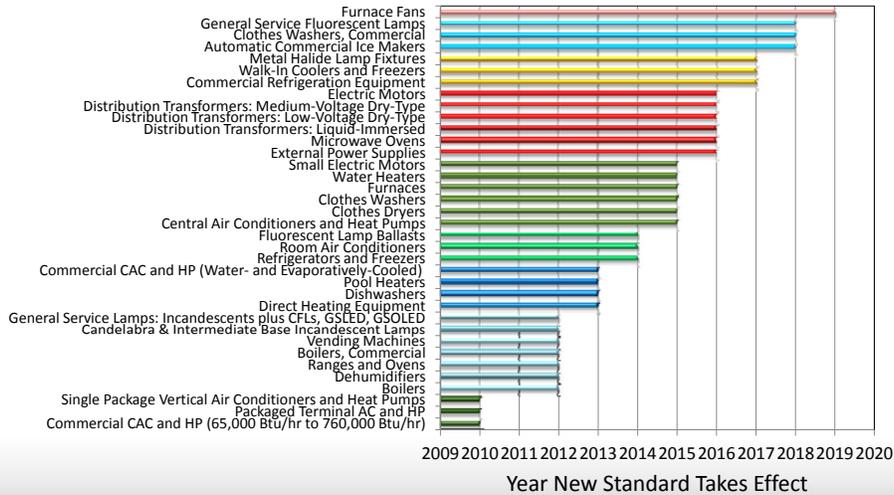
6th Plan Accomplishments Thru 2013



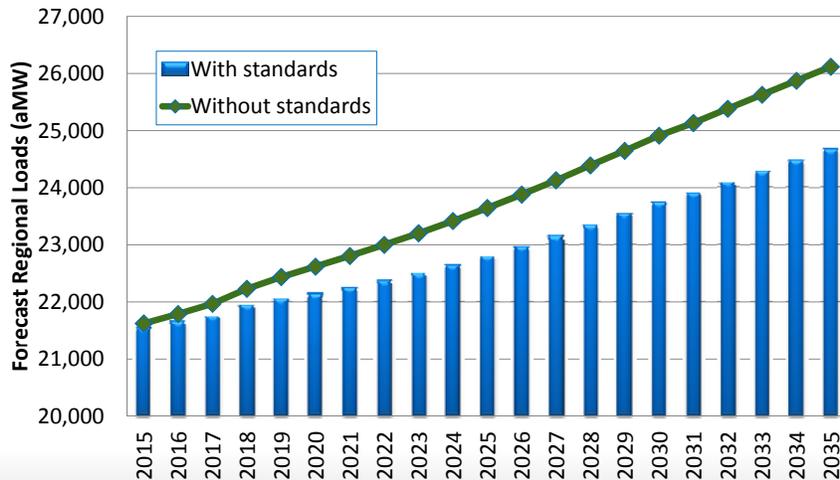
Baseline Load Forecast is Lower



36 New Federal Efficiency Standards Take Effect This Decade



Impact of Federal Standards on Loads*



Number of Units in Year 20*

Unit	6 th Plan (2030)	7 th Plan (2035)
Count of Homes	7.6 Million	7.2 Million
Commercial Floor Area	3.8 Billion SF	4.0 Billion SF
Industrial MWh Sales	4,900 aMW	4,600 aMW

- New commercial floor area lower by ~30%
- New homes added ~15% lower
- Industrial loads lower ~ 6%

*Medium Forecast

Significant Changes from Recent Stock Assessments

Single Family	6 th Plan	7 th Plan
Electric water heating	64%	55%
Electric space heating	46%	34%

Commercial	6 th Plan	7 th Plan
kWh use per SF	16	14
Lighting power per SF (W)	1.15	0.99
Electric space heating	27%	32%

Why Measures Were Culled from 6th Plan?

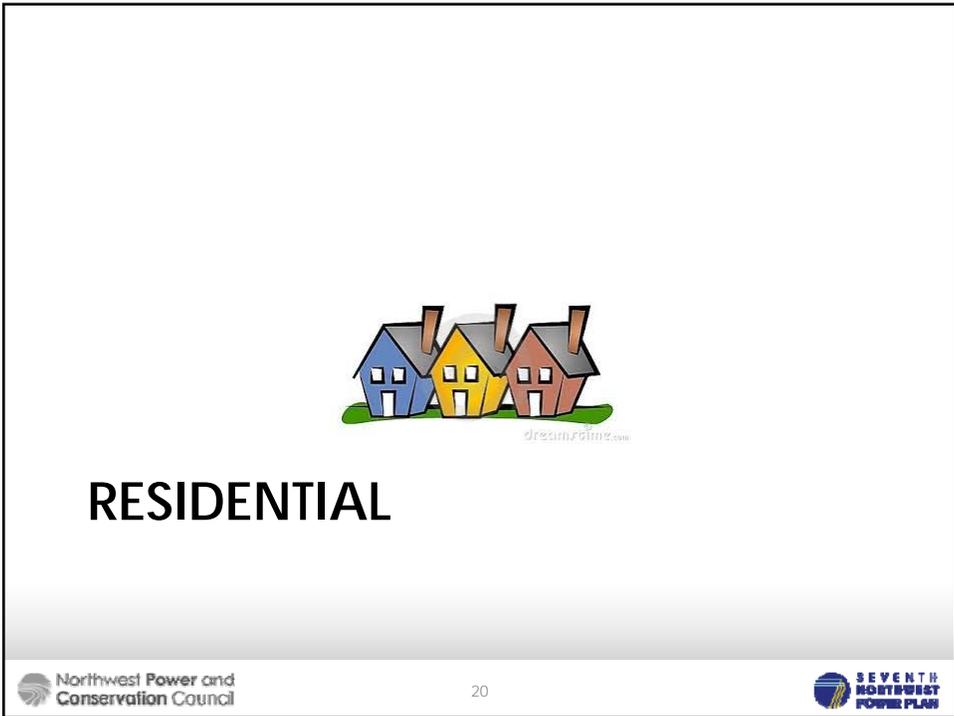
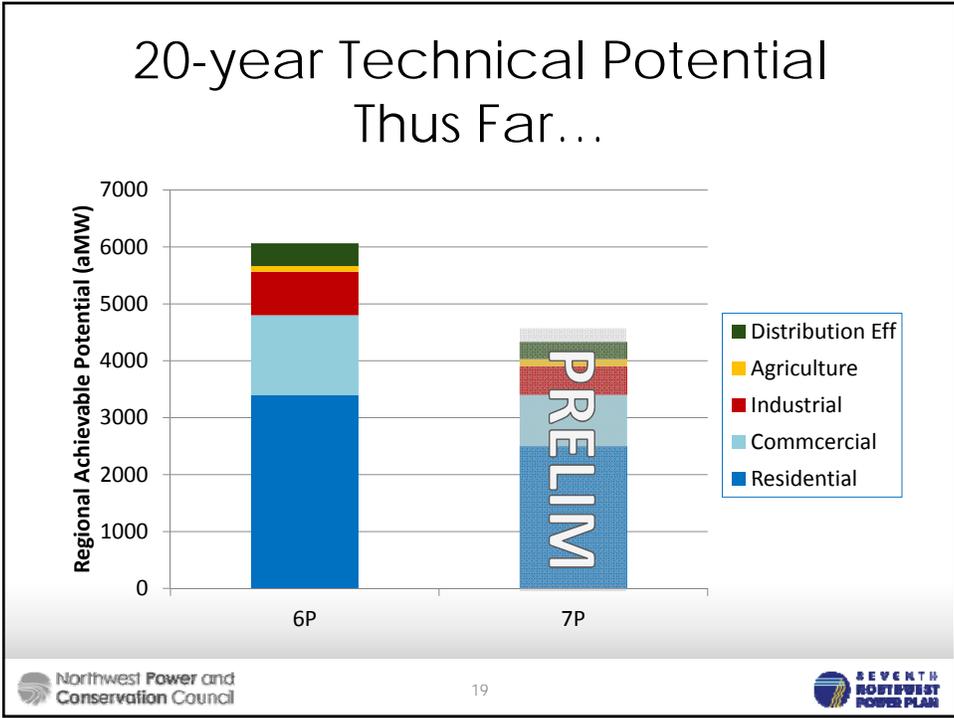
- Measure or efficiency level is now standard practice
- Captured by federal standards or state codes
- Reduced estimate of potential from updated stock assessment or technical analysis



Sector-specific examples coming up

What's New in 7th Plan Conservation Potential Assessment

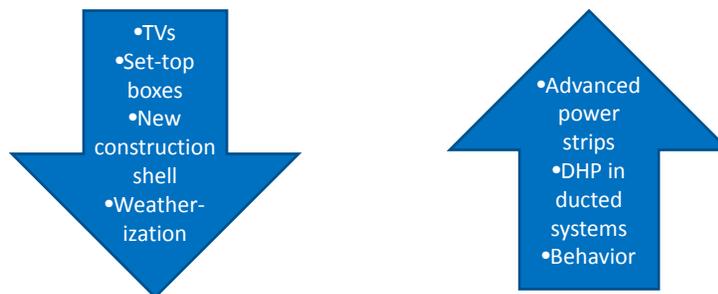
- Stock assessments (Residential, Commercial, Industrial)
- Notable new measures
 - Solid state lighting
 - Advanced power strips
 - Variable Refrigerant Flow (VRF) for HVAC
 - Ductless heat pumps for forced air furnaces
 - Advanced commercial rooftop HVAC unit control
- Notable measure savings updates from RTF
 - Adjustments to residential weatherization & HVAC
 - Irrigation hardware
 - Commercial cooking equipment



Residential Measures

- Heat pump dryers*
- ENERGY STAR monitors
- ENERGY STAR desktops
- ENERGY STAR laptops
- Advanced Power Strips
- Efficient Oven
- Efficient Microwave
- Attic Insulation
- Wall Insulation
- Floor Insulation
- Low-U Windows
- Infiltration control
- Duct sealing
- Heat Recovery Ventilation
- Variable speed heat pumps
- Efficient air source heat pumps*
- Ductless heat pumps
- Drain water heat recovery
- WIFI thermostats
- LED lighting
- ENERGY STAR refrigerators
- ENERGY STAR freezers
- Drain water heat recovery
- Heat pump water heater
- ENERGY STAR dishwasher
- Low-flow showerheads
- Faucet aerators
- Behavior/COP
- Efficient electric vehicle chargers
- Controls, Commissioning & Sizing
- Solar water heaters*
- ENERGY STAR clothes washers*

Residential Potential: Key Drivers of Change From 6th Plan



Overall 20-year Residential Sector remaining technical potential is expected to *decrease*.

COMMERCIAL



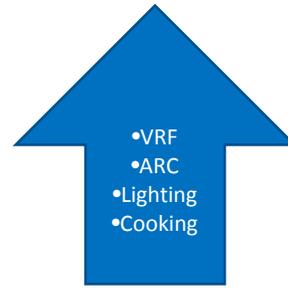
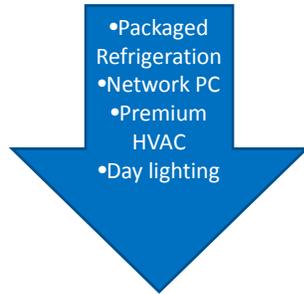
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Commercial Measures

- Advanced Rooftop Controller
- Chiller - equip retrofits
- Commercial Clothes Washers
- Commercial Computer & Monitor
- Commercial Energy Management
- Compressed Air
- Cooking Equipment
- Data Centers
- Demand Control Ventilation
- DHW - Efficient Tanks
- DHW - Showerheads
- ECM on VAV Boxes
- Exterior Building Lighting
- Grocery Refrigeration Bundle
- Lighting Controls Interior
- Lighting-Interior
- Low Pressure Distribution Complex HVAC
- Motors – Rewind
- Municipal Sewage Treatment
- Municipal Water Supply
- Parking Lighting
- Premium Fume Hood
- Pre-Rinse Spray Valve
- Secondary Glazing Systems
- Smart Plug Power Strips
- Street and Roadway Lighting
- Switched Reluctance/Permanent Magnet Motors
- Ultra Low Energy Building-New
- Variable Speed Chiller
- Variable Refrigerant Flow (VRF)
- Water Cooler Controls
- Weatherization - School

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Commercial Potential: Key Drivers of Change from 6th Plan



Overall 20-year Commercial Sector remaining technical potential is expected to *decrease*.

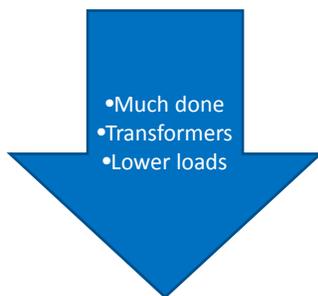


INDUSTRIAL

Industrial Measures

- Air Compressor Demand Reduction
- Air Compressor Equipment
- Air Compressor Management
- HighBay Lighting
- Lighting Controls
- Motors: Efficient Rewind
- VSD Controls
- Motor Management Program
- Fan Efficient Centrifugal
- Food: Fans and Blowers
- Other: Fans and Blowers
- Fan ASD Control
- Premium Pump
- Pump ASD Control
- Food: Cooling and Storage
- Food: Refrig Storage O&M
- Metal: New Arc Furnace
- Paper: Medium Consistency Pump
- Mech Pulp: Refiner Replacement
- Mech Pulp: Premium Process
- Mech Pulp: Refiner Plate Improvement
- Kraft Pulp: Effluent Treatment System
- Kraft Pulp: Efficient Agitator
- Paper: Efficient Pulp Screen
- Paper: Premium Fan
- Paper: Material Handling
- Wood: Replace Pneumatic Conveyor
- Wood: Hydraulic Press
- Cold Storage Retrofit
- Cold Storage Tuneup
- Fruit Storage Refer Retrofit
- CS Retrofit -- CO2 Scrub
- CS Retrofit -- Membrane
- Fruit Storage Tuneup
- Groc Dist Retrofit & Tuneup
- Generic O&M

Industrial Potential: Key Drivers of Change from 6th Plan



Overall 20-year Industrial Sector remaining technical potential is expected to *decrease*.

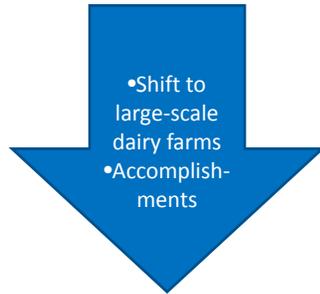


AGRICULTURE

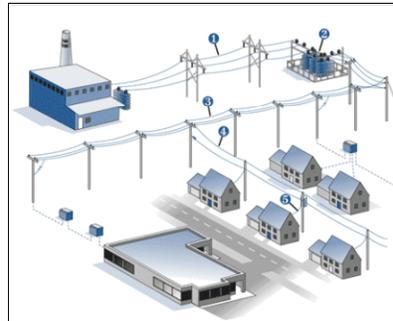
Ag Measures

- **Irrigation**
 - Hardware (nozzles, gaskets, drop replacements)
 - Scientific irrigation systems
 - Low-energy spray application (LESA)
 - High/medium to low pressure drop
- **Motor rewind**
- **Dairy**
 - Milk Precoolers
 - VFD on milkers
 - Efficient lighting
 - Refrigeration heat recovery
- **Area (barn) lights**

Agriculture Potential: Key Drivers of Change from 6th Plan



Overall 20-year Agricultural Sector remaining technical potential is expected to *increase*.



ELECTRIC DISTRIBUTION SYSTEM

Distribution System Measures

- Reduce system voltage via line drop compensation
- Minor system improvements
 - Phase load balancing, feeder load balancing, VAR management
- Major system improvements
 - Substation upgrades & select re-conductoring
- Automatic end-of-line voltage control



Distribution System Potential: Key Drivers of Change from 6th Plan

- Accomplishments
- Lower Applicability
- Lower loads

Overall 20-year Distribution System remaining technical potential is expected to *decrease*.

WRAP UP

Themes

- Strong program achievements since 6th Plan
- Major codes & standards activity
- Continue to find new opportunities
- Significant remaining potential
 - More conservation >\$100 per MWh than 6th Plan
 - However, significant amounts of low-cost potential remains

Next Steps

- **Completing technical analysis**
- **Soliciting feedback on technical analysis**
- **Bundle results**
- **Draft supply curves ready final review by CRAC and Council in March**
- **Draft 7th Plan inputs for RPM final in March**