

Agriculture Measures in the 7th Plan

CRAC Meeting
January 28, 2015

Ag Measures

- **Irrigation**
 - Hardware
 - SIS
 - LESA
 - High/medium to low pressure drop
 - Motor rewind
- **Dairy**
 - Milk Precoolers
 - VFD on milkers
 - Efficient lighting
 - Refrigeration heat recovery
 - Area lights



What is LESA?



- Applying water 12-18” above ground surface
- Low nozzle pressure (~6 psig)
- Water savings 15% average over season compared to MESA
- Complementary to SIS



Expected Costs & Savings

- Could potentially replace all center pivot irrigation systems on flat-slope field
- Preliminary analysis from BPA & WSU
 - Per center pivot system - ~20 MWh
 - Regional potential – ~35 aMW
 - Incremental cost - \$2500/system

LESA

| Question | Answer |
|----------------------------------|-------------------------------------|
| In 6 th Plan? | No |
| RTF UES? | No |
| 7P Source of cost/savings | BPA |
| 7P Source of counts | 2013 FRIS |
| 7P Source of baseline saturation | New technology, minimal penetration |

LESA

| Parameter | Sixth Plan | Seventh Plan (draft) |
|--|------------|----------------------|
| Unit Savings at busbar (kWh) | NA | 172 |
| Levelized Cost (\$/MWh) | NA | \$14 |
| Baseline EE Saturation | NA | Nil |
| Number of Units (20 years) | NA | 1.7M |
| Achievable Technical Potential (aMW over 20 years) | NA | 26 |

Irrigation Hardware*

| Question | Answer |
|----------------------------------|-------------------------------------|
| In 6 th Plan? | Yes, 2 permutations |
| RTF UES? | Yes, 13 permutations |
| 7P Source of cost/savings | RTF |
| 7P Source of counts | 2013 Farm & Ranch Irrigation Survey |
| 7P Source of baseline saturation | Unknown, use 6P estimates |

*Gasket, nozzle, drop replacements

Irrigation Hardware

| Parameter | Sixth Plan | Seventh Plan (draft) |
|--|------------|-----------------------------------|
| Unit Savings at busbar (kWh) | 110 - 985 | 1 - 435 |
| Levelized Cost (\$/MWh) | \$9 - 146 | \$0 – 1205; \$35: weighted avg |
| Baseline EE Saturation | 70% | 70% |
| Number of Units (20 years) | 1.4M | 1.7M |
| Achievable Technical Potential (aMW over 20 years) | 56 | 53 |

Irrigation Pressure Drop*

| Question | Answer |
|----------------------------------|-------------------------------------|
| In 6 th Plan? | Yes, 4 permutations |
| RTF UES? | No |
| 7P Source of cost/savings | 6 th Plan |
| 7P Source of counts | 2013 Farm & Ranch Irrigation Survey |
| 7P Source of baseline saturation | Unknown, use 6P estimates |

*High/Med P -> Low P on center pivot and alfalfa hand/wheel lines

Irrigation Pressure Drop

| Parameter | Sixth Plan | Seventh Plan (draft) |
|--|------------|--------------------------------|
| Unit Savings at busbar (kWh) | 184-576 | 175-763 |
| Levelized Cost (\$/MWh) | \$3.5-145 | \$5-190 \$33 – weighted avg |
| Baseline EE Saturation | 70% | 70% |
| Number of Units (20 years) | 564k | 710k |
| Achievable Technical Potential (aMW over 20 years) | 20 | 26 |

Motor Rewind

| Question | Answer |
|----------------------------------|-------------------------------------|
| In 6 th Plan? | No |
| RTF UES? | Yes |
| 7P Source of cost/savings | RTF |
| 7P Source of counts | 2013 FRIS, number and size of pumps |
| 7P Source of baseline saturation | Unknown |

Motor Rewind

| Parameter | Sixth Plan | Seventh Plan (draft) |
|--|------------|----------------------|
| Unit Savings at busbar (kWh) | NA | 840-1549 |
| Levelized Cost (\$/MWh) | NA | \$20-26 |
| Baseline EE Saturation | NA | 30% |
| Number of Units (20 years) | NA | 13k |
| Achievable Technical Potential (aMW over 20 years) | NA | 2.8 |

Water Management

| Question | Answer |
|----------------------------------|--|
| In 6 th Plan? | Yes, SIS |
| RTF UES? | No, but standard protocol (out-of-compliance) |
| 7P Source of cost/savings | 6 th Plan |
| 7P Source of counts | 2003 Columbia Basin GWMA |
| 7P Source of baseline saturation | Savings estimate includes assumption of saturation |

Water Management

| Parameter | Sixth Plan | Seventh Plan (draft) |
|--|------------|-------------------------------|
| Unit Savings at busbar (kWh) | 69-284 | 71-293 |
| Levelized Cost (\$/MWh) | \$9-78 | \$19-92 \$30: weighted avg |
| Baseline EE Saturation | NA | NA |
| Number of Units (20 years) | 650k | 940k |
| Achievable Technical Potential (aMW over 20 years) | 16 | 19 |

Dairy Efficiency

| Question | Answer |
|----------------------------------|--|
| In 6 th Plan? | Yes, 9 permutations |
| RTF UES? | No, but plate heat exchanges have Protocol |
| 7P Source of cost/savings | 6 th Plan |
| 7P Source of counts | 2012 Census of Ag |
| 7P Source of baseline saturation | Unknown, use 6P estimates, though increase saturation of VFD |

Dairy Efficiency

| Parameter | Sixth Plan | Seventh Plan (draft) |
|---|------------|--|
| Unit Savings at busbar (kWh) | 0.6 - 7.6 | 0.6 – 7.9 |
| Levelized Cost (\$/MWh) | <10 | <0 |
| Baseline EE Saturation | 14%-86% | 11% (heat recovery) to 95% (VSD and pre-coolers) |
| Number of Units (20 years) (1000 lbs of milk produced) | 20M | 23M |
| Achievable Technical Potential (aMW over 20 years) | 9 | 1.3 |

Area (barn) Lighting

| Question | Answer |
|----------------------------------|------------------------------------|
| In 6 th Plan? | No |
| RTF UES? | Yes |
| 7P Source of cost/savings | RTF |
| 7P Source of counts | 2012 Census of Ag, number of farms |
| 7P Source of baseline saturation | Use street lighting estimate |

Area Lighting

| Parameter | Sixth Plan | Seventh Plan (draft) |
|--|------------|----------------------|
| Unit Savings at busbar (kWh) | NA | 280 |
| Levelized Cost (\$/MWh) | NA | <0 |
| Baseline EE Saturation | NA | 10% |
| Number of Units (20 years) | NA | 133k |
| Achievable Technical Potential (aMW over 20 years) | NA | 3.0 |

VFD on Irrigation Pump, High Volume Low Speed Fans

| Question | Answer |
|----------------------------------|--|
| In 6 th Plan? | No |
| RTF UES? | No, but VFDs have protocol |
| 7P Source of cost/savings | ? |
| 7P Source of counts | Number of pumps, number of dairy farms |
| 7P Source of baseline saturation | ? |

These two measures may not be included due to lack of data and/or likely low potential

Other RTF Measures

- RTF has UES for:
 - Stock watering tanks
 - VFD Potato/Onion Shed
- However, these likely will be excluded from 7P potential estimate because of low remaining potential and/or lack of data on number of units