Cooling Options for Power Plants
## Cooling Options for Power Plants

### Wet Cooling
- **Once Through**
- **Evaporative Cooling Tower**

### Water Conservation
- **Wet-Dry Cooling Tower**
- **Parallel Condensing**

### Dry Cooling
- **Air Cooled Condenser**

Depending on site needs, there are a wide range of cooling solutions.
Water Savings Options – Alternatives to Wet Evaporative

<table>
<thead>
<tr>
<th>Estimated Water Savings</th>
<th>Wet/Dry Options</th>
<th>Parallel Condensing</th>
<th>Air Cooled Condensing</th>
</tr>
</thead>
<tbody>
<tr>
<td>All wet with high cycles of conc.</td>
<td>0-10%</td>
<td>10-30%+</td>
<td>30-90%*</td>
</tr>
<tr>
<td>Wet/Dry Options</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coil Type</td>
<td>ClearSky</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10-30%+</td>
<td>10-30%+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Pros and Cons</td>
<td>+ Relatively low up front costs</td>
<td>+ Plume abatement</td>
<td>+ Flexible water savings</td>
</tr>
<tr>
<td>+ Highest power cycle efficiency</td>
<td>- No back-to-back layout</td>
<td>+ Matches wet cooling cycle efficiency</td>
<td>+ Lower cost, power use, footprint vs dry</td>
</tr>
<tr>
<td>+ Lowest parasitic power</td>
<td>- Higher pump head and fan power</td>
<td>+ Matches wet pump head</td>
<td>+ Retrofit is possible</td>
</tr>
<tr>
<td>+ Smallest footprint</td>
<td>- Coil, damper and valve maintenance</td>
<td>+ Smaller footprint than dry or parallel</td>
<td>- Highest complexity</td>
</tr>
<tr>
<td>- Most water usage</td>
<td></td>
<td>- Higher fan power</td>
<td>- May still plume</td>
</tr>
</tbody>
</table>

Different options require different amounts of water

* Parallel condensing theoretically can reach any water savings required between 0-100%
Water Losses in a Evaporative Cooling Tower

Example, 800 mW CC Plant*

- Evaporation – ~1% of the flow rate per 10° F range 3,520 gpm
- Blowdown - Portion of circulating water purged to control cycles of concentration 1,170 gpm
- Drift - Drops entrained in exhaust air, approx 0.001% of flow 2 gpm
- Makeup – Water required to replace system losses 4,692 gpm

Making up ~ 6.7 MGD ~ 2.7% of circulating rate of 253 MGD

* 1/3 steam condensing: 176,000 gpm circulating with 20°F range, 4 cycles of concentration

© 2014 SPX Cooling Technologies Inc.
ModuleAir™ ACC

- Modularization of Components
- Shop assembled bundles including steam manifold and condensate headers
- Site welding reduced
- Integrated Structures
  - Fan bridge/plenum/bundle
- Shop assembled steel trusses
  - Sized for container transport
- Reduced field-assembly hours

Modular concept featuring SRC® fin tube technology
An estimated 1,065 facilities are impacted by impingement standards (> 2 MGD water usage)

Best Technology Available (BTA) required as determined by EPA Director on a case-by-case basis.

Facilities with >125 MGD withdrawal must conduct Entrainment Characterization Study

New units at existing facilities must either:

1. Reduce actual intake flow to that commensurate with closed cycle systems
2. Design intake screen systems to achieve > 90% of entrainment reduction of closed cycle systems

Existing facilities must comply as NPDES permits are renewed:

- If > NPDES renewal is >42 months from date of final ruling, full compliance is required.
- If < 42 months to renewal date, interim BTA requirement to apply based on Director’s Best Professional Judgement.
Questions?

Paul Lindahl  
Director, Market Development  
SPX Thermal Equipment & Services  
[mailto:paul.lindahl@spx.com](mailto:paul.lindahl@spx.com)  
913-664-7588

Ramasamy Sithambaram  
Sales Manager – Dry Cooling  
SPX Cooling Technologies  
[mailto:ramasamy.sithambaram@spx.com](mailto:ramasamy.sithambaram@spx.com)  
913-664-7528

Kent Martens  
Chief Technical Advisor  
SPX Cooling Technologies  
[mailto:kent.martens@spx.com](mailto:kent.martens@spx.com)  
913-664-7501
Counterflow Cooling Tower

Evaporative, back-to-back configuration
Counterflow Wet Dry Cooling Tower
Air Cooled Condensers

ACC design minimizes water usage