Highlights of the new Emission Norm for the Regulation of Light Pollution in Northern Chile

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The old Light Pollution Norm: Results

- Public Lighting replacement in 34 municipalities. To comply with DS686/1998 MINECON
La Serena, before and after the massive replacement of 7.176 fixtures, 2005 - 2006
Results in the mining sector
This success was due to:

OPCC received systematic support from AURA CARSO and ESO for outreach activities. An strong role of the MMA (in terms of a consistent policy for dark sky protection). SUBDERE, Regional and municipal efforts to reduce energy waste and for better illumination. The mining sector was very sensitive in environmental issues.

A relevant portion of public lighting was too old and inefficient. It was not difficult to comply with the DS686 in technical and economic terms. OPCC is seen as a technical office providing support to the public and private sector.
Some of the LED are very blue emitters and are very popular among authorities.
LED Billboards: 7000-9000cd/m²
Emission Norm for the Regulation of Light Pollution in Northern Chile, DS Nº 043 de 2012, MMA

- MMA coordinated the effort, OPCC proposed the restrictions with the support of:
  - IAC/OTPC, Canary Island, Spain
  - CieloBuio, Italy
  - DLLyV from UNT (Tucumán, Argentina)
  - Profesor Leopoldo Rodríguez, L.F. PUCV
General Rule of D.S. Nº 043/2012 MMA

- Full cut off: A maximum of 0.49cd/1000 lumen at 90°,
Justification to limit ULOR

Near horizontal emitted light is more harmful than the light going to the zenith: scattering

Full cut off criterion is applied to:

- Environmental, functional, ornamental and industrial illumination in the D.S. № 043/2012 MMA
Spectral restriction to blue light

The new rule limits emissions of light in the blue and near ultraviolet light parts of the spectrum to not more than 15% of the total amount emitted in the other visible colors.
3 Spectral Restrictions

- It establishes restrictions regarding the visible espectrum (between 380 and 780nm):
  - Not more than 15% of light emission between 300 and 380nm;
  - Not more than 15% for the range 380 - 499nm;
  - Not more than 50% for the range between 781 and 1.000nm.
Spectrum of 7.000K LED

Espectrum of 3.200K LED
Avoid over illumination
D.S. Nº 043/2012

Over illumination is restricted to not more than 20% over the Chilean standard (NSEG 9 n 71) for minimal levels in public and industrial lighting.
Sport and recreational
D.S. Nº 043/2012

- Allowed level of 10cd/KLm at 90º
- A visor to cut upper hemisphere emission
- Not more curfew
Billboards with inner sources of illumination

- Must emit not more than 50 cd/m² at night
- Must be installed horizontally

No curfew is applied
Not spectral restriction
Externally illuminated billboards

Full cut off
Must be installed horizontally
Laser beams and searchlights: limit is down to 70%
Ruta del Algarrobo: Near La Silla and Las Campanas Observatories
HPS fixtures just installed that comply with D.S. Nº686/1998 MINECON
Alternative illumination
Amber LED
Fray Jorge National Park: First Starlight Reserve in Southern Hemisphere
Starlight Turistic Destination: Region of Antofagasta.
Pumalín park, Palena Province, Chilean Patagonia.
Dark sky in Patagonia: (21,68 mag arc sec²)
The future: Monocromatic amber light near professional observatories, a national norm and a light pollution law for Northern Chile and the declaration of our sites, together with Hawaii and Canary Island as part of the World Heritage as declared by UNESCO
Thanks to many people in Chile and from all over the world for protecting our night skies!!!