

A desert lodge under the Milky Way: warm window light along a low roofline, and nothing aimed above the horizontal.

NLC ACADEMY · EPISODE 22

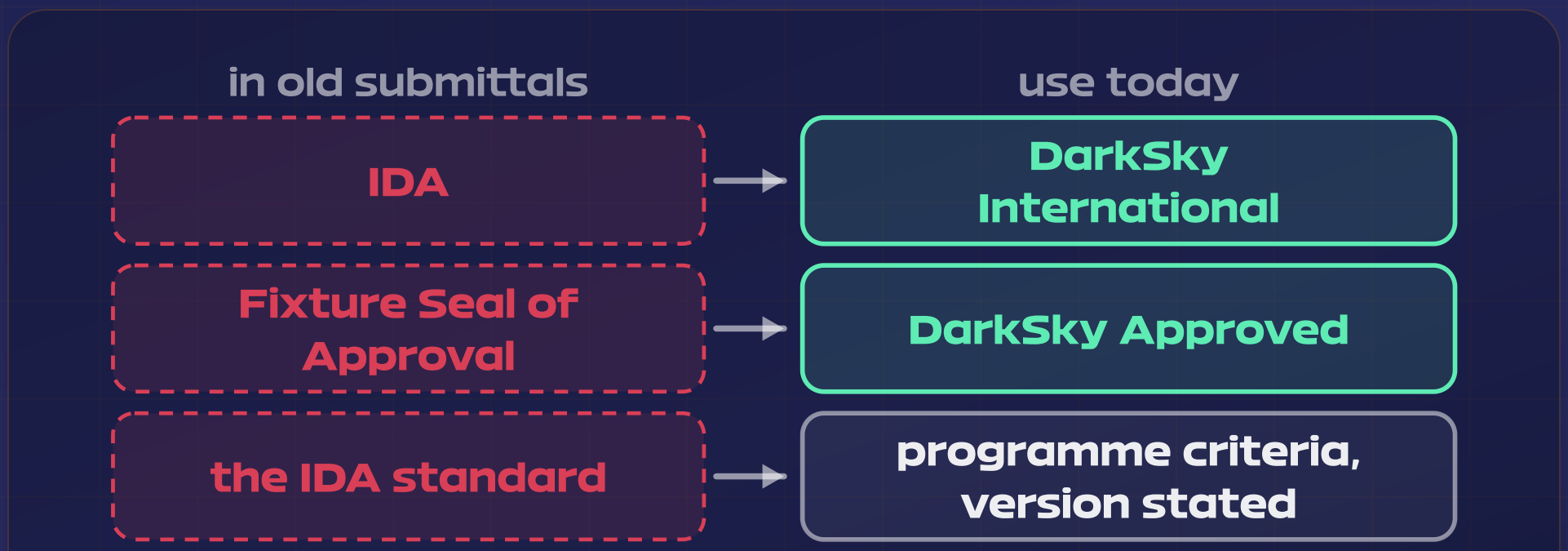
Light the ground. Not the sky.

Saudi Arabia holds some of the largest certified dark sky parks and the first two DarkSky Approved Resorts. Many outdoor lighting clauses still cite old names and rules.

START WITH THE NAME

IDA is now DarkSky International

ILLUSTRATIVE



1. The International Dark-Sky Association renamed itself **DarkSky International** in 2023. [1]
2. The Fixture Seal of Approval is now **DarkSky Approved**, as Appendix A of the v3.1 guidelines records. [2]

DarkSky publishes certification criteria, not consensus standards. Cite the programme and its version: "DarkSky Approved Luminaires, v3.1".

WHAT CERTIFICATION ACTUALLY REQUIRES

DarkSky Approved Luminaires, version 3.1

CCT ceiling

Residential, Commercial and Pedestrian Comfort: nominal 3000 K or lower. [2]

≤ 3000 K

Uplight, set by category

Residential up to 50 lm. Commercial and Pedestrian Comfort: 5 lm up to 1,000 lm output, then 0.5%, max 50 lm. Sea Turtle Sensitive: zero. [2]

0-50 lm

Tilt

No adjustment that tilts more than 5° upward. [2]

≤ 5°

Dimming

Above 500 lm, dimming to 10% or less, shown in the ordering matrix. [2]

≤ 10%

Photometry from an ISO 17025 lab to LM-79-2019 or EN 13032. Simulated photometry is not accepted. [2]

CCT: ONE PRODUCT OR A FAMILY?

A selectable product and a model family are judged differently

ILLUSTRATIVE · DarkSky v3.1

one luminaire, selectable settings

2700 K | 3000 K | 4000 K — not eligible

family of separate fixed models

2700 K | 3000 K | 4000 K — 2 of 3 listable

1.2.A judges the product, not the setting
3.1.B: dedicated matrix of compliant codes

1. **One luminaire** with tunable or field-selectable CCT: if any setting is above 3000 K, the product is not eligible (§1.2.A). [2]
2. **A family of separate models**: the maker may list only its compliant models in a dedicated DarkSky ordering matrix (§3.1.B). [2]

So a 3000/4000/5000 K selectable driver cannot be certified. A 3000 K model from a family that also sells 4000 K can be, if it is ordered from that matrix.

METHOD AGAINST THRESHOLD

TM-15 classifies light. It does not limit it.

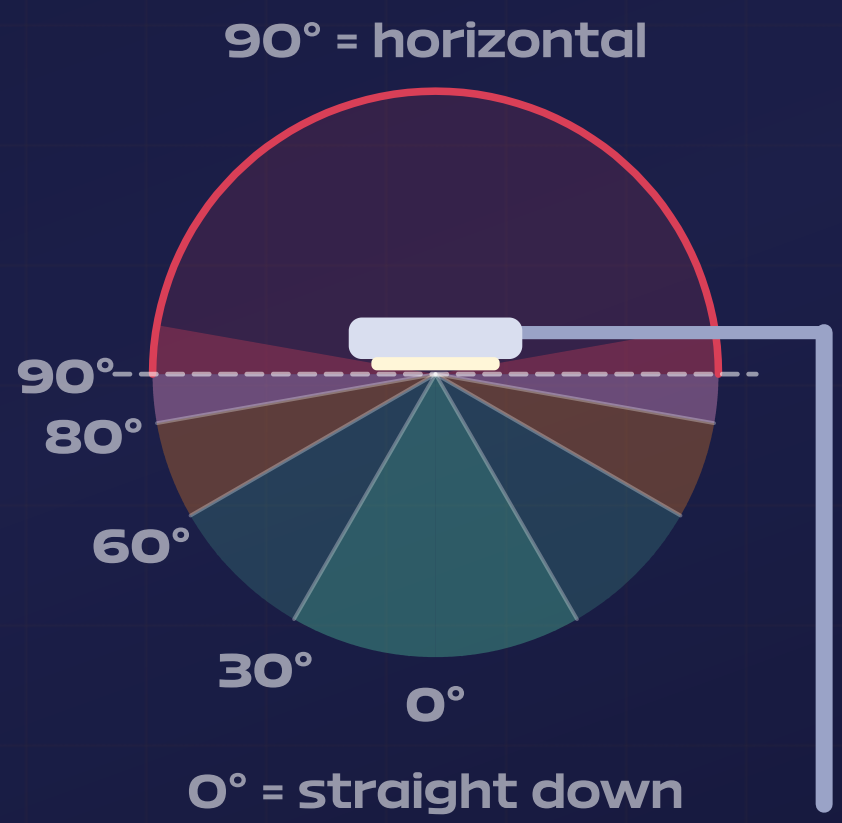
ILLUSTRATIVE · IES TM-15

uplight: to the sky

- UH, 100-180
- UL, 90-100

downward light

- very high, 80-90
- high, 60-80
- mid, 30-60
- low, 0-30



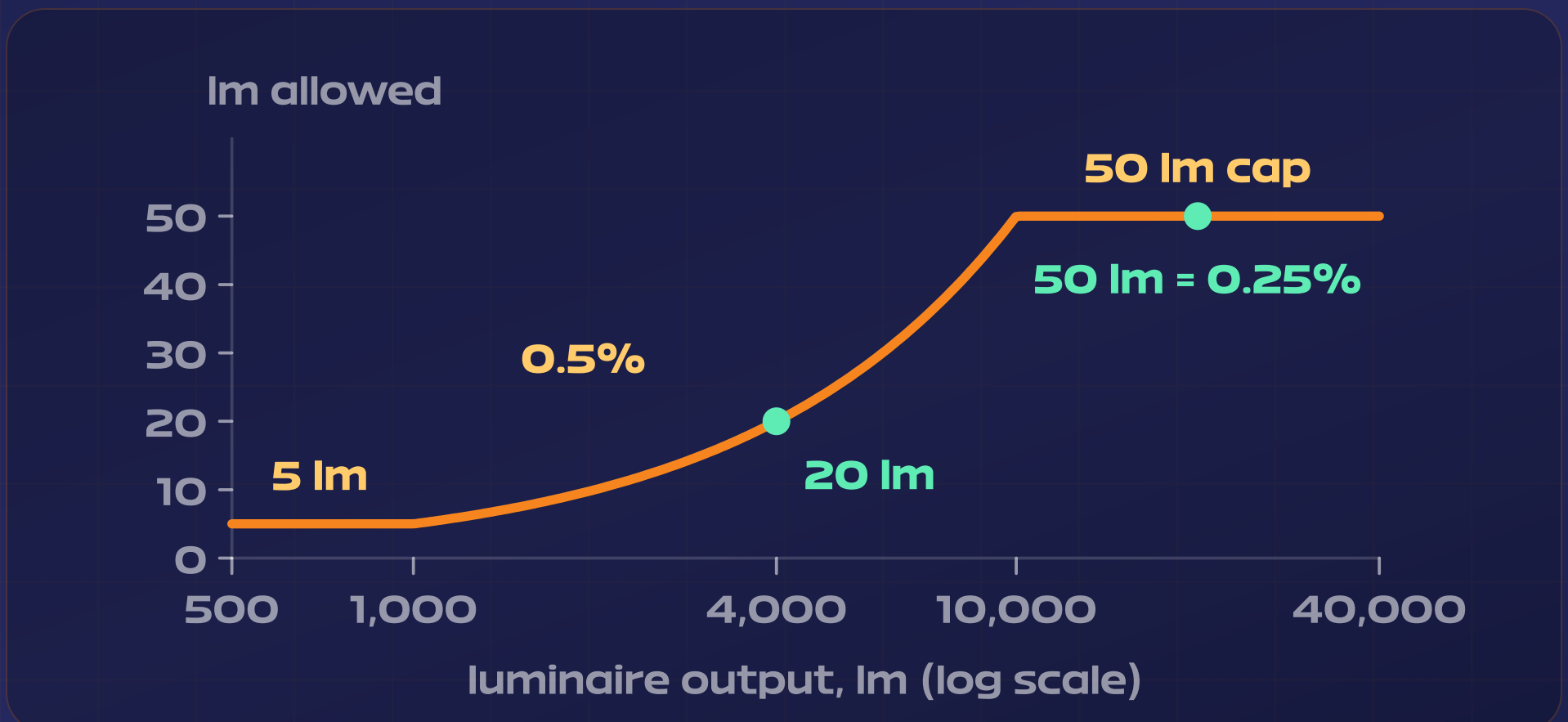
1. IES TM-15 defines the Luminaire Classification System zones, including uplight: UL 90-100° and UH 100-180°. [3]
2. It sets no limits. Limits come from a certification, an ordinance or a tender.

DarkSky v3.1 uses these zones, then sets its own limits in lumens. [2][3]

UPLIGHT, IN LUMENS

The uplight limit depends on category and output

CALCULATED · DarkSky v3.1 §2.2, §2.3



1. Commercial: 5 lm up to 1,000 lm output, then 0.5% of output, never above 50 lm. Pedestrian Comfort: the same rule, up to 10,000 lm. [2]
2. Residential (up to 1,000 lm): 50 lm. Sea Turtle Sensitive (up to 4,000 lm): zero. [2]

"Fully shielded" is not a number. Ask for uplight in lumens, and the category it was judged against.

FOUR CITATIONS TO FIX

Metrics often cited to the wrong document

ULOR or ULR?

CIE S 017 defines ULOR for lamp flux in the reference position, and ULR for the luminaire as installed. [4]

ULR

B1 UO G1 is not a DarkSky rule

DarkSky v3.1 sets limits in lumens, not BUG. The IES example of a zero-uplight luminaire rates B2 UO G2. [2][3]

B2 UO G2

G-index is EU procurement

G ≥ 1.5 is EU GPP criterion TS9, rising to 2.0 near observatories. [5]

EU GPP TS9

RP-33 is deprecated

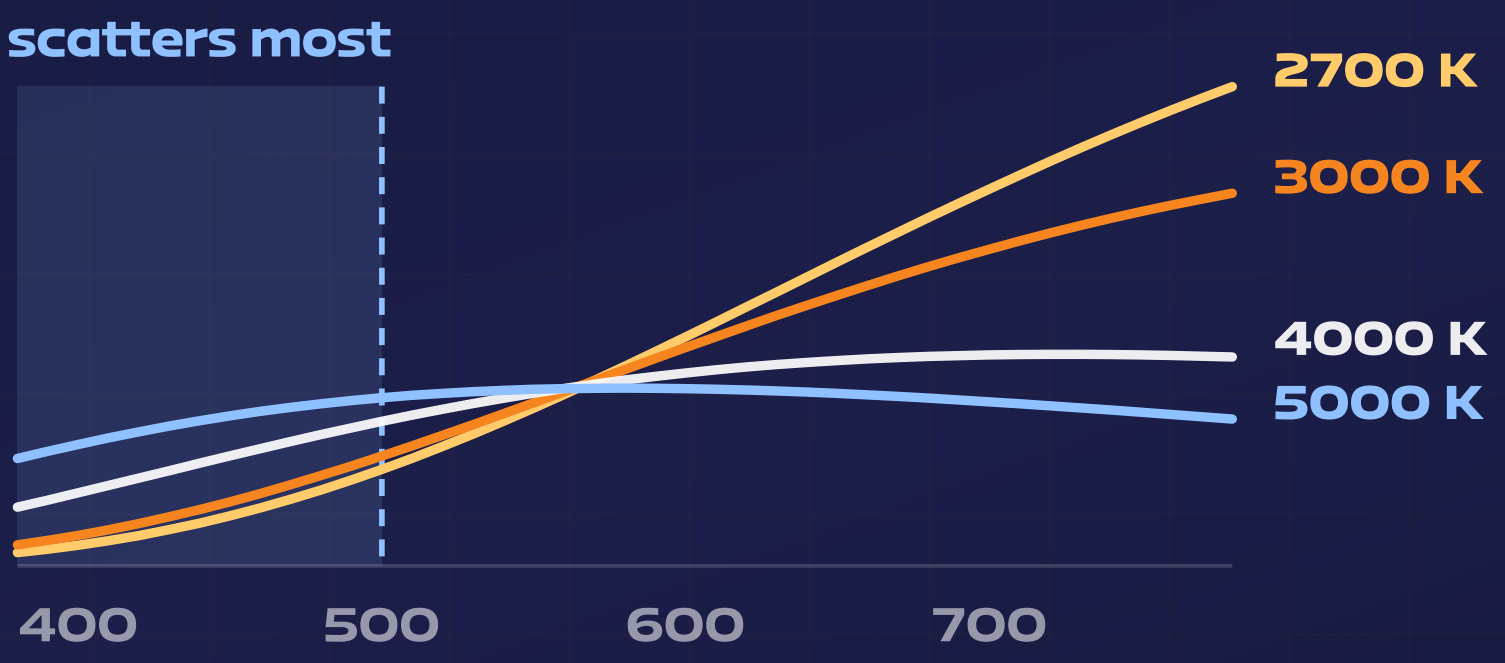
Replaced by ANSI/IES LP-2-20 and LP-11-20. Light trespass is LP-11-20 §3.2. [3]

LP-11-20

THE MECHANISM

Why short wavelengths cost more sky

CALCULATED · Planck



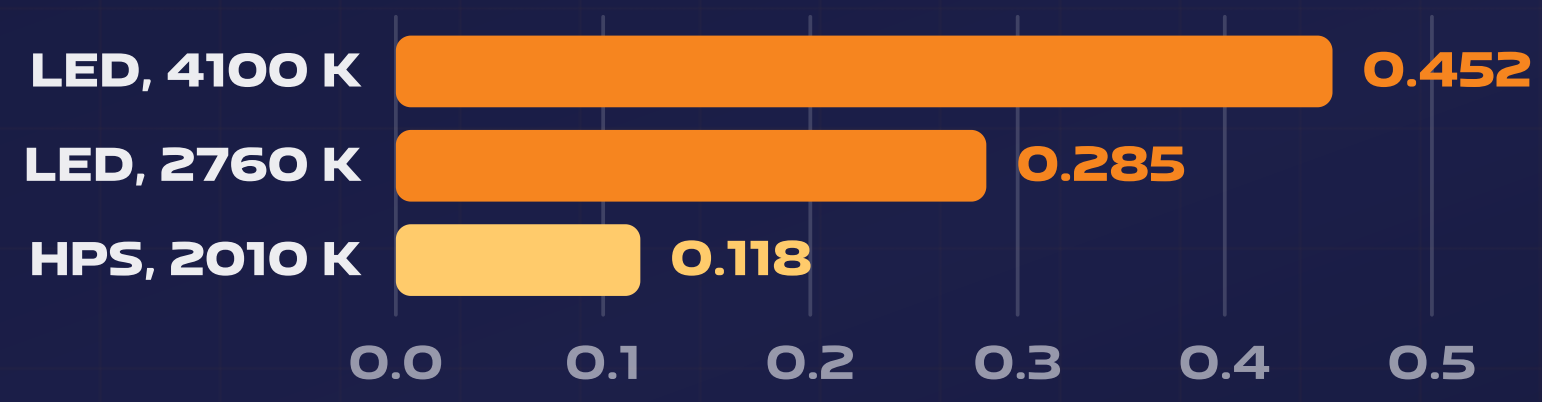
1. Rayleigh scattering by air molecules goes as the inverse fourth power of wavelength, so blue scatters far more than red.
2. The curves are blackbody spectra at equal visible output. Compare scatter per lumen delivered.

Two caveats: dust and aerosols scatter more evenly across wavelengths, and clouds shift the colour of skyglow. The blue penalty is a clear-sky result. [6][7]

A CATEGORY ERROR

Melanopic is not a skyglow metric

CALCULATED · Aubé 2013



a human melatonin index, not a skyglow metric

Melatonin Suppression Index, CIE D65 = 1

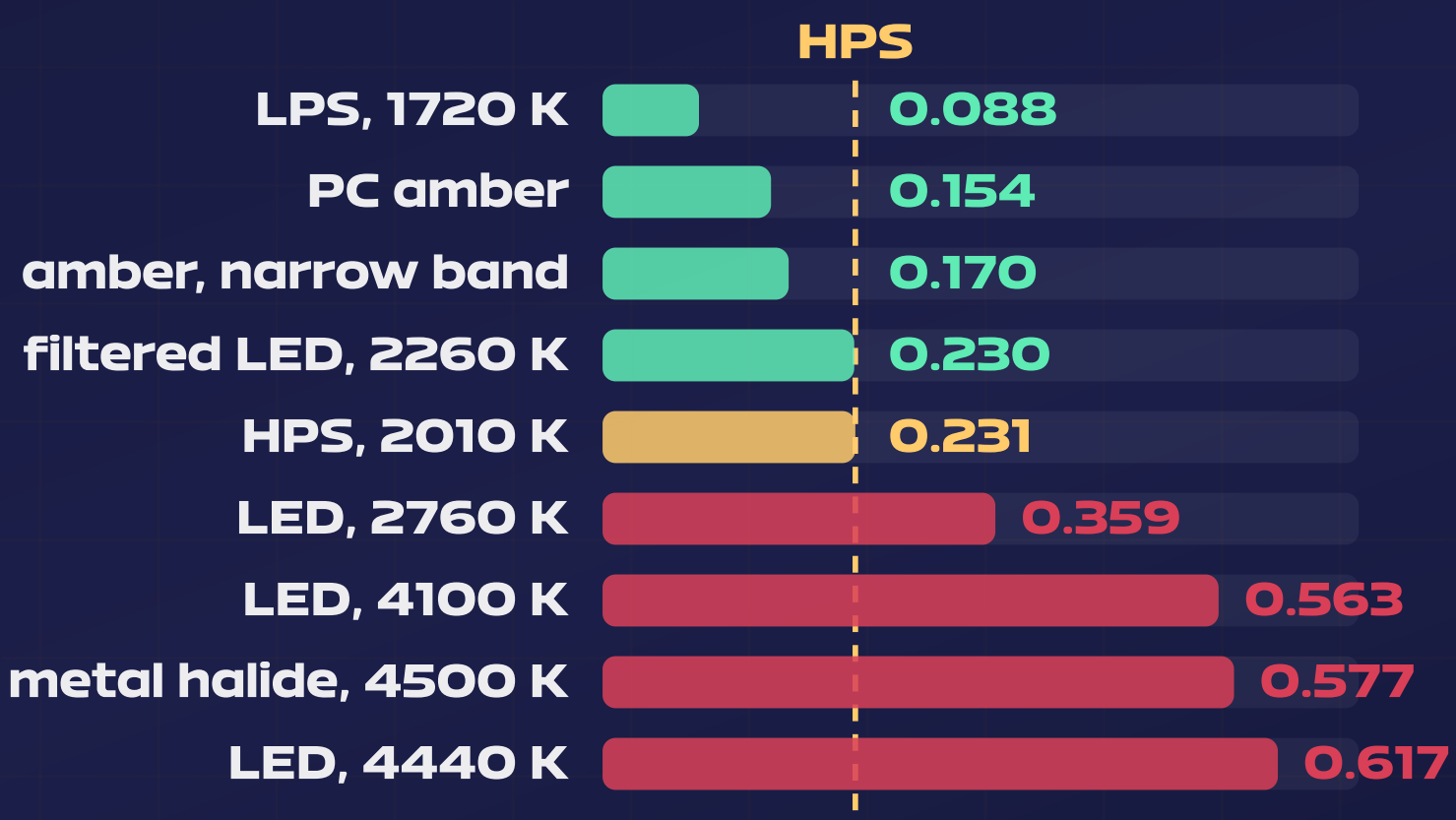
CIE S 026:2018 defines melanopic quantities for the human ipRGC response. A melanopic metric does not directly measure skyglow. [8]

Aubé's melatonin suppression index falls 37%, from 0.452 (LED, 4100 K) to 0.285 (LED, 2760 K). A drop, not a halving. [9]

ONE STUDY, NINE SPECTRA

In Aubé's spectra, unfiltered white LED scored worse per lumen than HPS

CALCULATED · Aubé 2013



Star Light Index per lumen, CIE D65 = 1
lower is better · measured CCT shown

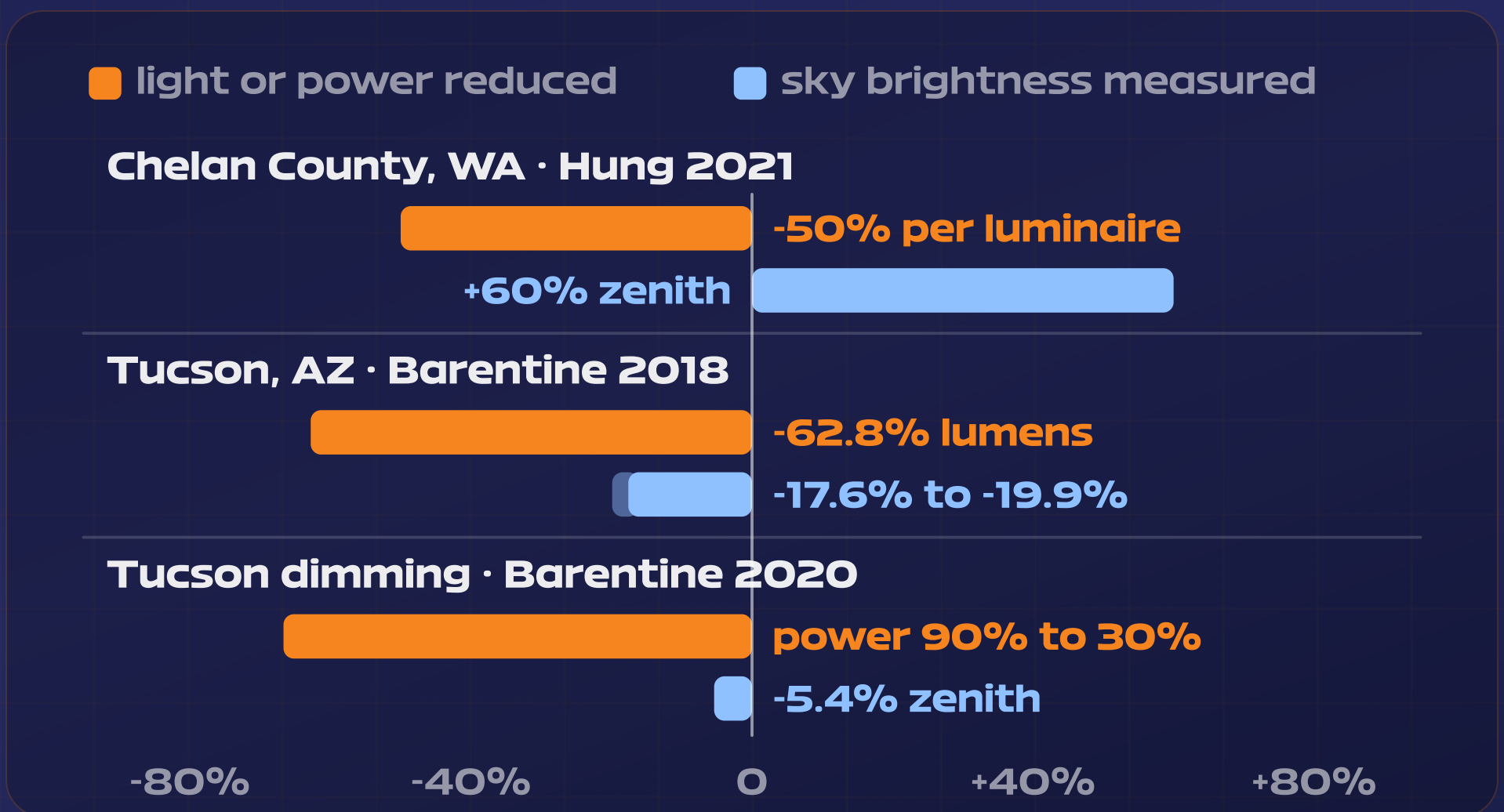
Direct light, equal lumens: the 2760 K LED scores 0.359, HPS 0.231, **1.55 times higher**. After clear-sky scattering: 1.76 times at the source, 1.60 times at 30 km. [9]

This compares lamps per lumen, not installations. DOE/PNNL modelled real conversions at 0.4 to 0.8 times the HPS skyglow unweighted, 0.2 to 1.6 times scotopic-weighted. [10]

THREE FIELD STUDIES

What three conversions did to the measured sky

MEASURED

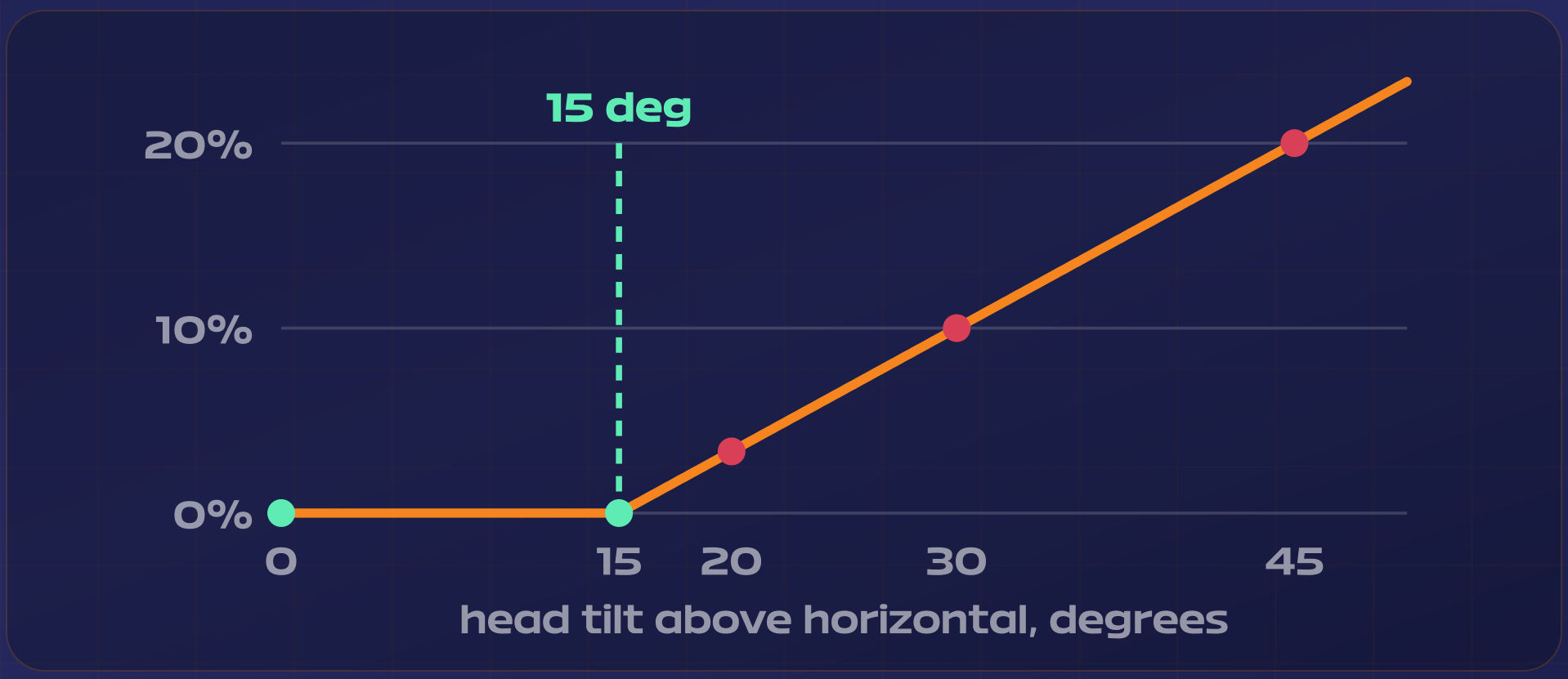


1. Chelan County: 3,693 HPS to fully shielded LED, 80% at 3000 K. A year later the zenith at one site was 60% brighter. [11]
2. Tucson: only 1 of 15 sites was conclusive (-17.6% to -19.9%). Dimming after midnight cut zenith brightness 5.4%; streetlights were about 14% of emissions. [12][13]

WHERE THE REAL LEVER IS

Aim beats spectrum, and tilt undoes aim

MODELLED



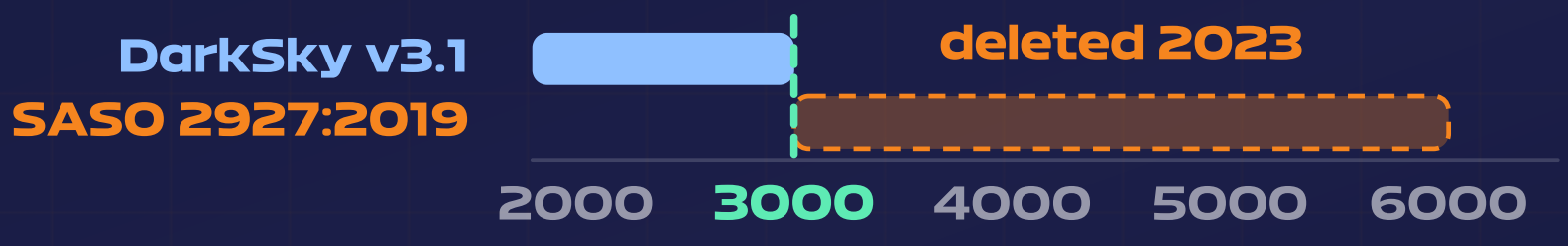
1. A flat, fully shielded luminaire emits nothing above the horizontal. Tilt it and uplight climbs with the angle.
2. EU GPP asks for 0.0% RULO at the installed tilt, not flat on a bench. [5]

Inside a city, most skyglow comes from light reflected off the ground. Cutting total lumens is the lever. [6]

THE SAUDI POSITION

Saudi Arabia's street-lighting standard once required 3000 to 6000 K

ILLUSTRATIVE · SASO 2927:2019, AMD2:2023



overlap at 3000 K only, until 2023

SASO 2927:2019 clause 10.2 required LED colour temperature between 3000 and 6000 K. Amendment SASO 2927:2019/AMD2:2023 deleted that sentence (Umm Al-Qura, 24 February 2023). [14]

1. Until then, a 2700 K LED streetlight within its scope could not comply.
2. Clause 10.3 calls for a 7-pin NEMA receptacle, capped (short-circuited) for future smart-city use. A shorting cap gives no dimming. [14]

WHERE THE DARK SKY IS

Saudi Arabia's certified dark sky sites

ILLUSTRATIVE



certified sites

1 **AlUla**
4 parks, 6,146 km2

2 **AlNufud**
largest in MENA

3 **Red Sea**
first 2 DarkSky resorts

schematic outline, parks drawn to scale by area

1 AlUla: four International Dark Sky Parks, 6,146 km², certified in 2024 and December 2025. [15]

2 AlNufud: 13,416 km², December 2025, the largest in MENA. Desert Rock and Nujuma: the first DarkSky Approved Resorts, August 2026. [15]

ALULA'S OWN RULES

What AlUla's outdoor lighting guide requires

Colour and efficacy

Max 2700 K, CRI 80 or more, LED at 120 lm/W or more (cl. 2.1.1).

≤ 2700 K

No upward light

Cut-off or full cut-off (cl. 2.4.1). Upward light is not permitted "under any circumstances" (cl. 2.5.4).

zero

Curfews

Zones LZ0 and LZ1 off at 22:00, LZ2 at midnight.

22:00

Scope

Excludes municipal and government street and public-space lighting (cl. 1.2.1c). Fine: SAR 3,000.

streets excluded

RCU, Technical Guide for Outdoor Lighting, v1, 2025. [16]

A CLAUSE YOU CAN CHECK

Two ways to write the requirement

PROPOSED TENDER WORDING · OUTDOOR LIGHTING

Option A, certification. Luminaires shall be DarkSky Approved under Luminaires Guidelines v3.1, in the stated category. If the family has non-compliant models, supply only codes from its dedicated DarkSky ordering matrix.

Option B, proposed requirement (not quoted from DarkSky). An ISO 17025 report shall state flux at 90° and above, in lumens, at the installed tilt: at most 5 lm up to 1,000 lm output, otherwise 0.5% of output and at most 50 lm. Nominal CCT 3000 K or lower, and no selectable setting above 3000 K.

Option B mirrors DarkSky's Commercial numbers. A project may go stricter, such as 0 lm near an observatory or a turtle beach, but label it as the project's own requirement.

SOURCES

Every number, with its source

[1] DarkSky International, new name and logo (2023)
[2] DarkSky Approved Luminaires Guidelines v3.1
[3] IES TM-15-11 Addendum A (BUG) · ANSI/IES LP-11-20
[4] CIE S 017:2020, 17-29-065 ULOR · 17-29-066 ULR
[5] EU GPP road lighting criteria, SWD(2018) 494
[6] Aubé 2015, Phil Trans R Soc B 370:20140117
[7] Kyba et al. 2012, MNRAS 425:701 (clouds)
[8] CIE S 026:2018, melanopic quantities
[9] Aubé, Roby, Kocifaj 2013, PLoS ONE e67798 · PMID 23861808
[10] US DOE, PNNL-26411 (2017), LED impact on sky glow
[11] Hung et al. 2021, J Environ Manage 292:112776
[12] Barentine et al. 2018, arXiv:1802.03474
[13] Barentine et al. 2020, JQSRT 253:107120
[14] Umm Al-Qura, SASO 2927:2019/AMD2:2023 (24 Feb 2023)
[15] DarkSky, Saudi Arabia places · AlNufud · Red Sea resorts
[16] RCU, Technical Guide for Outdoor Lighting v1 (2025)

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PRACTICAL LIGHTING ENGINEERING

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