

A Framework for Sustainable Design of Overhead Transmission Lines



Written by: Buck Fife, buck.fife@powereng.com

Steve Walker, steve.walker@powereng.com

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Outline

SD

Sustainable Development

Envision

The Envision Rating System

T-Line SD

SD Evaluation of Transmission Lines

Outline

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T-Line SD

SD

Sustainable Development

Sustainable Development

“development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”

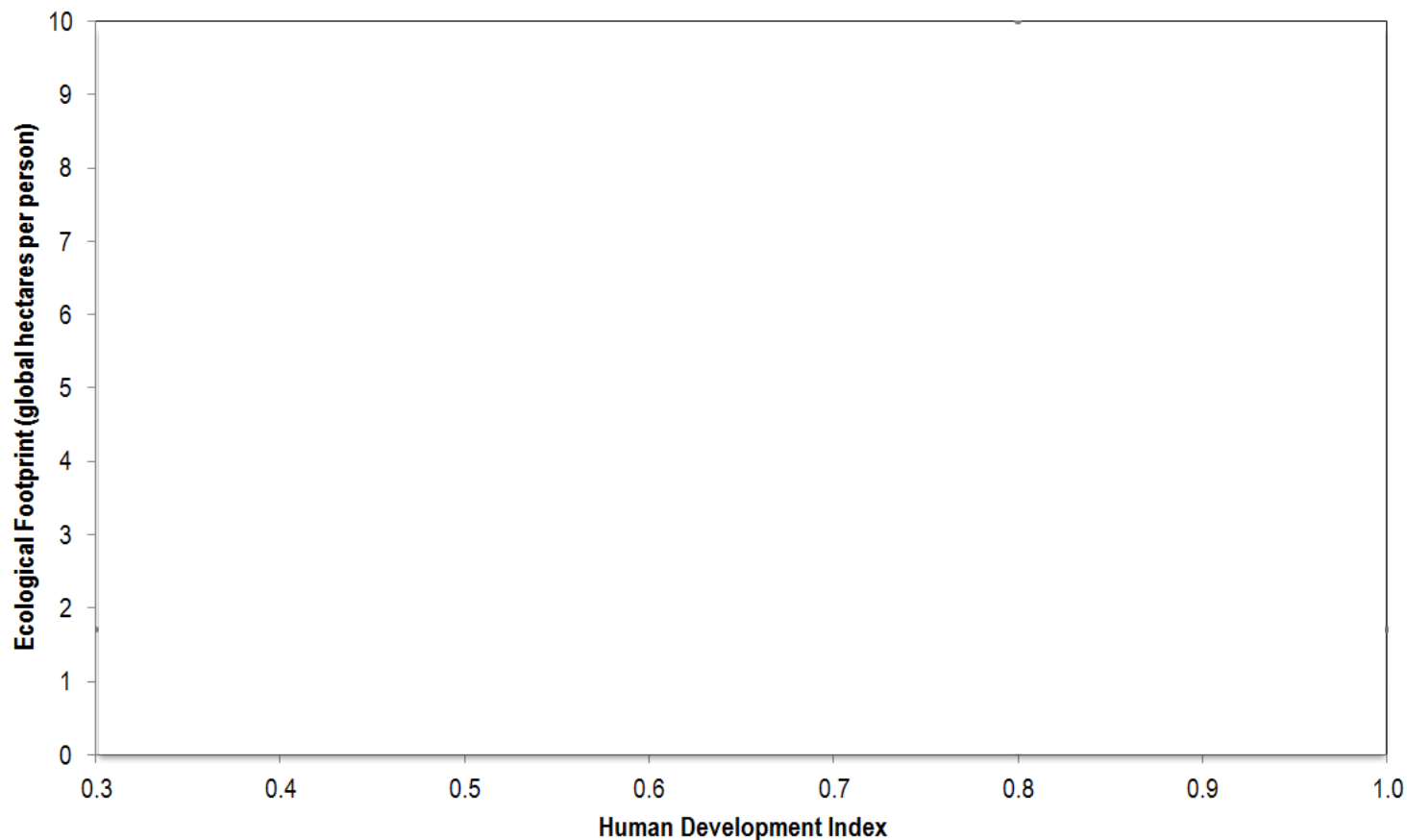
1987 UN World Commission on Environment and Development report,
also known as the Brundtland Commission Report

Sustainability Balancing Benefits and Costs

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Data Source: Ecological Footprint Explorer, <http://data.footprintnetwork.org/index.html>

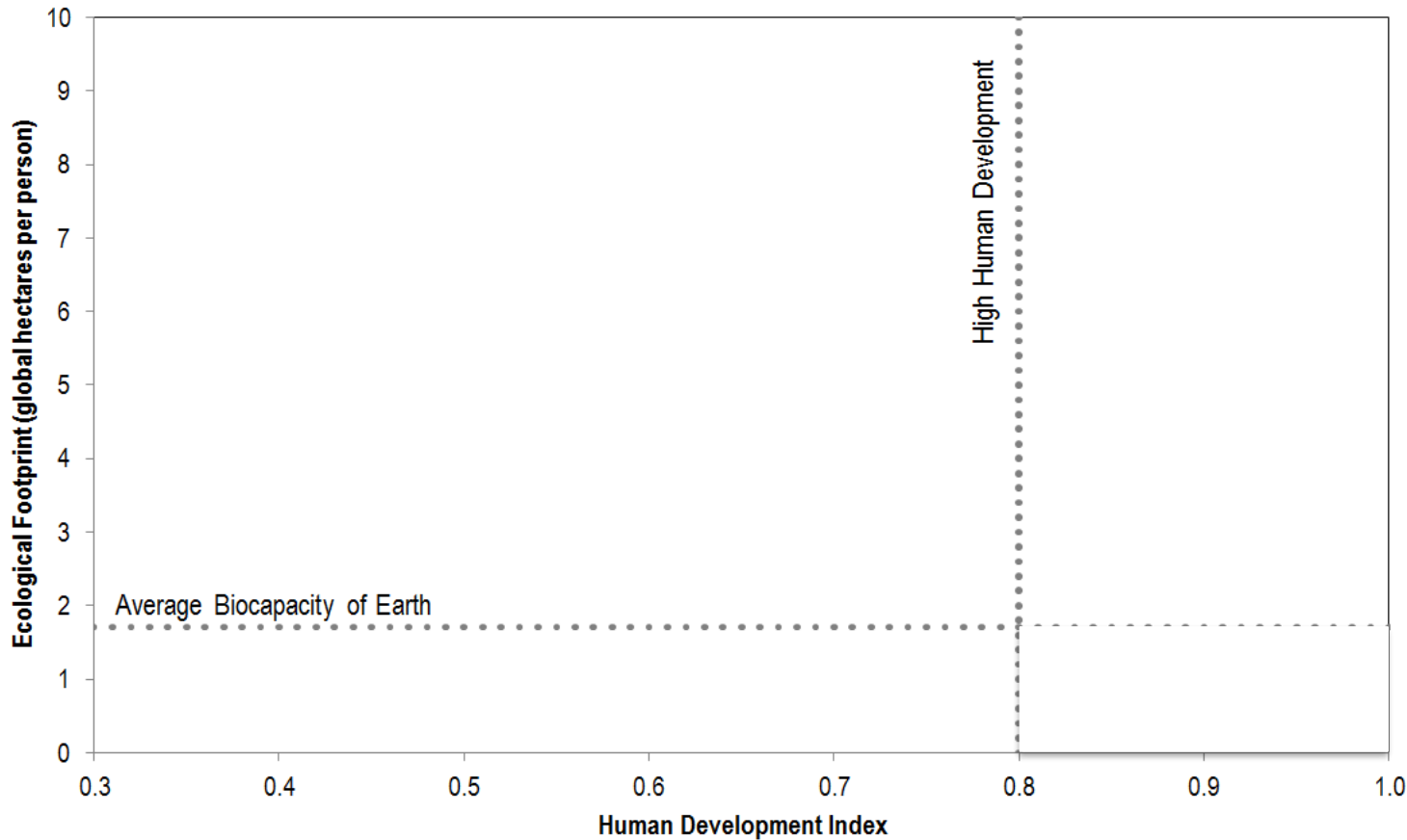
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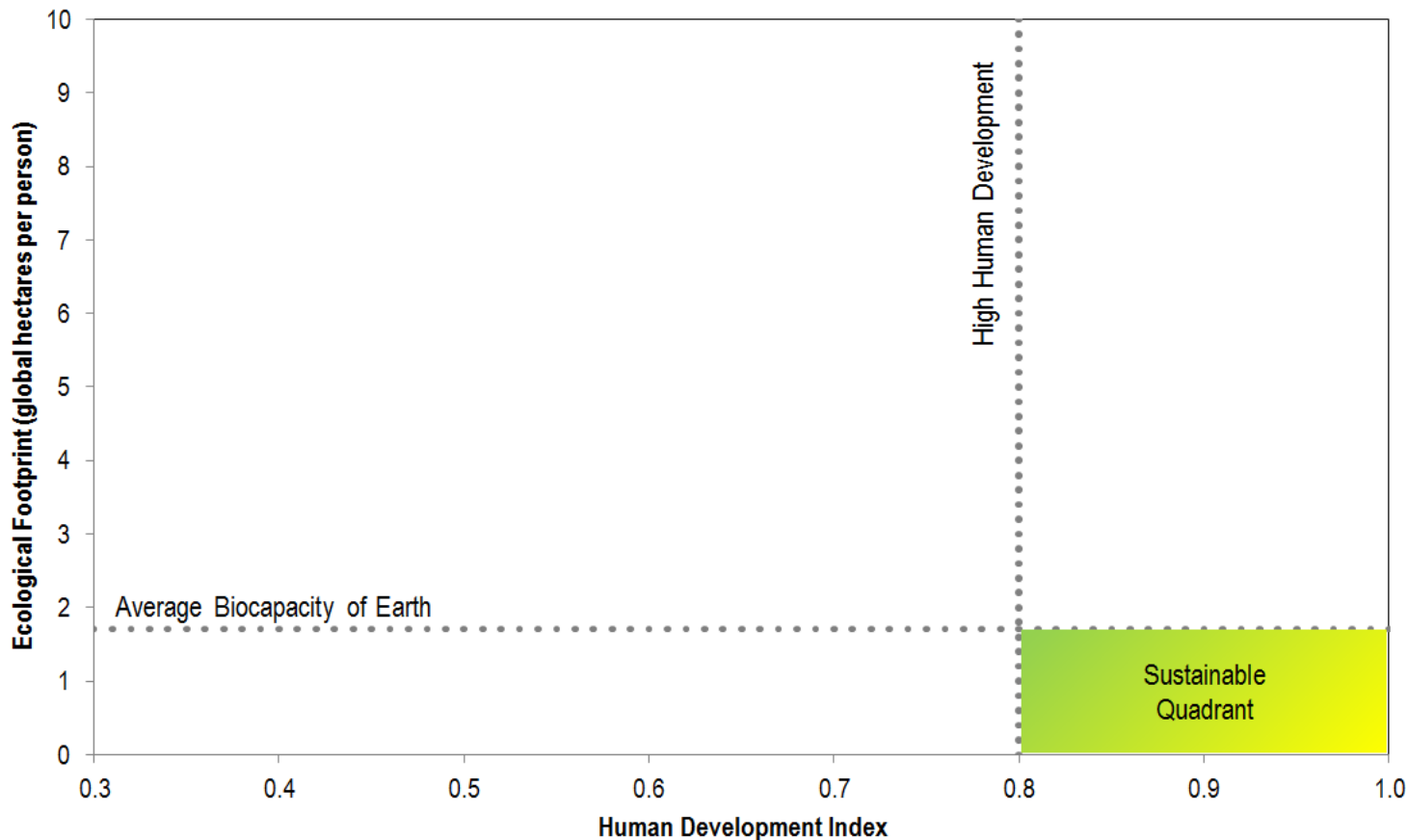
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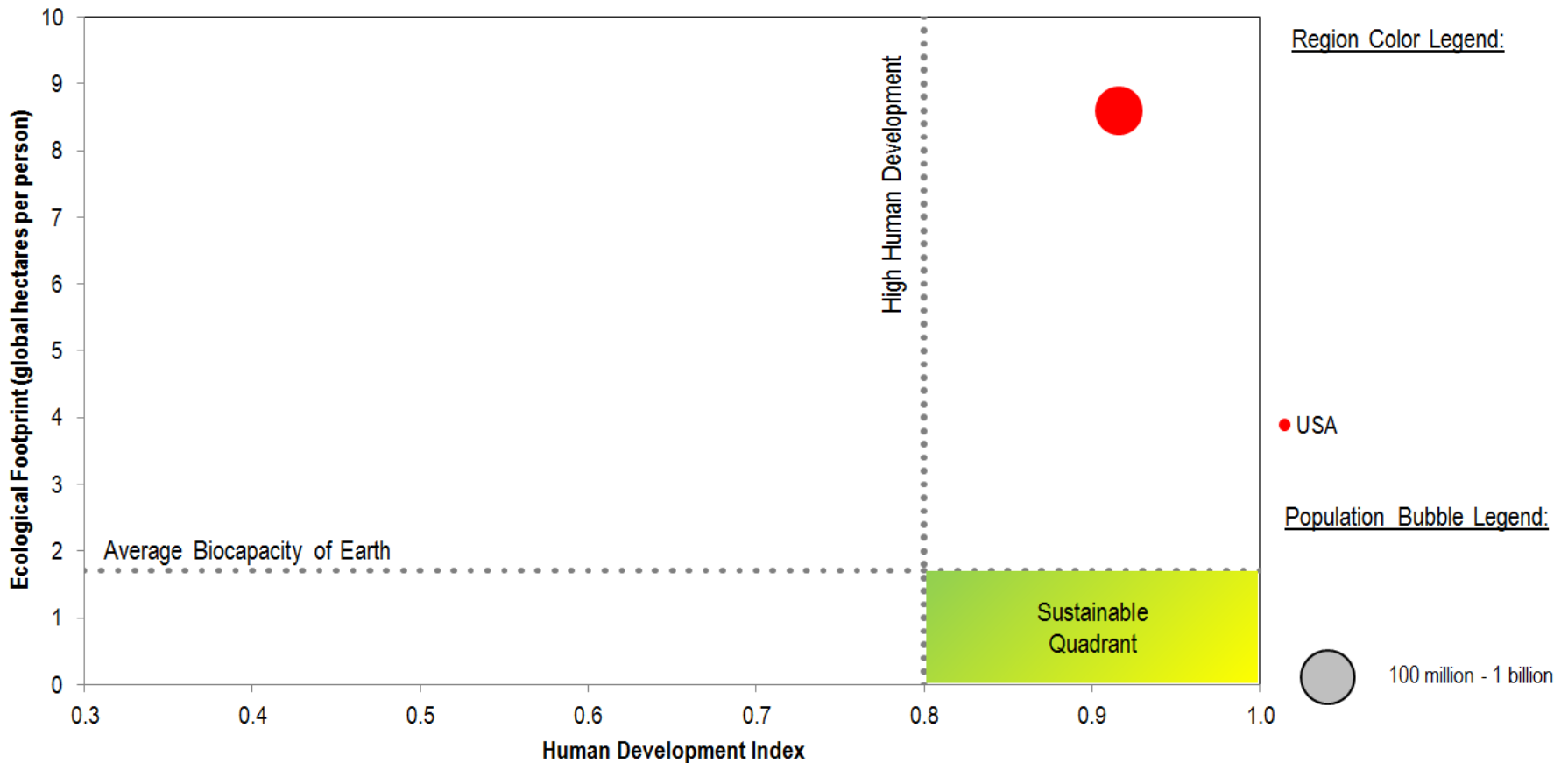
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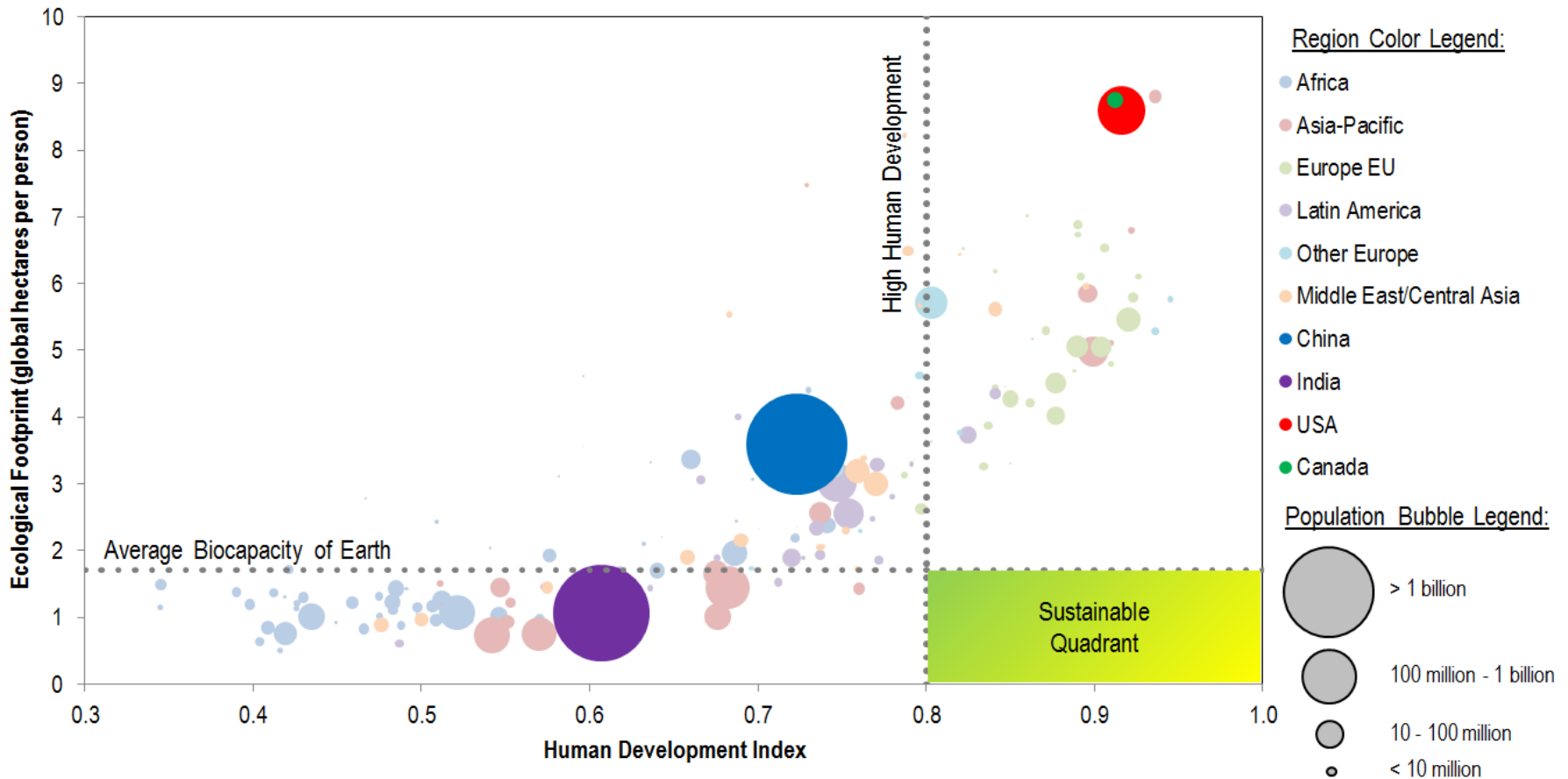
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Envision

The Envision Rating System

How do we do it?

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THE ENVISION™ RATING SYSTEM



Envision Credit Categories



Health and wellbeing of individuals and larger community



Communicate and collaborate to produce a truly sustainable project



Quantity, source, and characteristics of the resources to build and operate



Understand and minimize negative impacts on the natural world



Minimize emissions and ensure projects are resilient

Envision Credits

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1 PURPOSE

- QL1.1 Improve Community Quality of Life
- QL1.2 Stimulate Sustainable Growth & Development
- QL1.3 Develop Local Skills & Capabilities

2 WELLBEING

- QL2.1 Enhance Public Health & Safety
- QL2.2 Minimize Noise and Vibration
- QL2.3 Minimize Light Pollution
- QL2.4 Improve Community Mobility & Access
- QL2.5 Encourage Alternative Modes of Transportation
- QL2.6 Improve Site Accessibility, Safety & Wayfinding

3 COMMUNITY

- QL3.1 Preserve Historic & Cultural Resources
- QL3.2 Preserve Views & Local Character
- QL3.3 Enhance Public Space

- QL0.0 Innovate or Exceed Credit Requirements



1 COLLABORATION

- LD1.1 Provide Effective Leadership & Commitment
- LD1.2 Establish A Sustainability Management System
- LD1.3 Foster Collaboration & Teamwork
- LD1.4 Provide for Stakeholder Involvement

2 MANAGEMENT

- LD2.1 Pursue By-Product Synergy Opportunities
- LD2.2 Improve Infrastructure Integration

3 PLANNING

- LD3.1 Plan For Long-Term Monitoring & Maintenance
- LD3.2 Address Conflicting Regulations & Policies
- LD3.3 Extend Useful Life

- LD0.0 Innovate or Exceed Credit Requirements



1 MATERIALS

- RA1.1 Reduce Net Embodied Energy
- RA1.2 Support Sustainable Procurement Practices
- RA1.3 Use Recycled Materials
- RA1.4 Use Regional Materials
- RA1.5 Divert Waste From Landfills
- RA1.6 Reduce Excavated Materials Taken Off Site
- RA1.7 Provide For Deconstruction & Recycling

2 ENERGY

- RA2.1 Reduce Energy Consumption
- RA2.2 Use Renewable Energy
- RA2.3 Commission & Monitor Energy Systems

3 WATER

- RA3.1 Protect Fresh Water Availability
- RA3.2 Reduce Potable Water Consumption
- RA3.3 Monitor Water Systems

- RA0.0 Innovate or Exceed Credit Requirements



1 SITING

- NW1.1 Preserve Prime Habitat
- NW1.2 Protect Wetlands & Surface Water
- NW1.3 Preserve Prime Farmland
- NW1.4 Avoid Adverse Geology
- NW1.5 Preserve Floodplain Functions
- NW1.6 Avoid Unsuitable Development on Steep Slopes
- NW1.7 Preserve Greenfields

2 LAND + WATER

- NW2.1 Manage Stormwater
- NW2.2 Reduce Pesticide & Fertilizer Impacts
- NW2.3 Prevent Surface & Groundwater Contamination

3 BIODIVERSITY

- NW3.1 Preserve Species Biodiversity
- NW3.2 Control Invasive Species
- NW3.3 Restore Disturbed Soils
- NW3.4 Maintain Wetland & Surface Water Functions

- NW0.0 Innovate or Exceed Credit Requirements



1 EMISSIONS

- CR1.1 Reduce Greenhouse Gas Emissions
- CR1.2 Reduce Air Pollutant Emissions

2 RESILIENCE

- CR2.1 Assess Climate Threat
- CR2.2 Avoid Traps & Vulnerabilities
- CR2.3 Prepare For Long-Term Adaptability
- CR2.4 Prepare For Short-Term Hazards
- CR2.5 Manage Heat Island Effects

- CR0.0 Innovate or Exceed Credit Requirements

Line Design Perspective

SOME THOUGHTS ON ENVISION

It is Serious, Detailed, and Holistic

And it is important and exciting!!! But, it can be a difficult first step.

THE ENVISION™ RATING SYSTEM



T-Line SD

SD Evaluation of Transmission Lines

An Envision Credit Example

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An Envision Credit Example

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RA1.1

REDUCE NET EMBODIED ENERGY

An Envision Credit Example

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RA1.1

REDUCE NET EMBODIED ENERGY

Conserve energy by reducing the net embodied energy of project materials over the project life

An Envision Credit Example

Life Cycle Assessment (LCA)

- Material extraction
- Transportation
- Refinement
- Manufacture
- Maintenance
- Operation



RA1.1

REDUCE NET EMBODIED ENERGY

Conserve energy by reducing the net embodied energy of project materials over the project life

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RA1.1

REDUCE NET EMBODIED ENERGY

Conserve energy by reducing the net embodied energy of project materials over the project life

Reduce quantity of material used

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**CONDUCTOR
ALUMINUM
AREA**

RA1.1

REDUCE NET EMBODIED ENERGY

Conserve energy by reducing the net embodied energy of project materials over the project life

Reduce quantity of material used

Line Design Perspective

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RA1.1

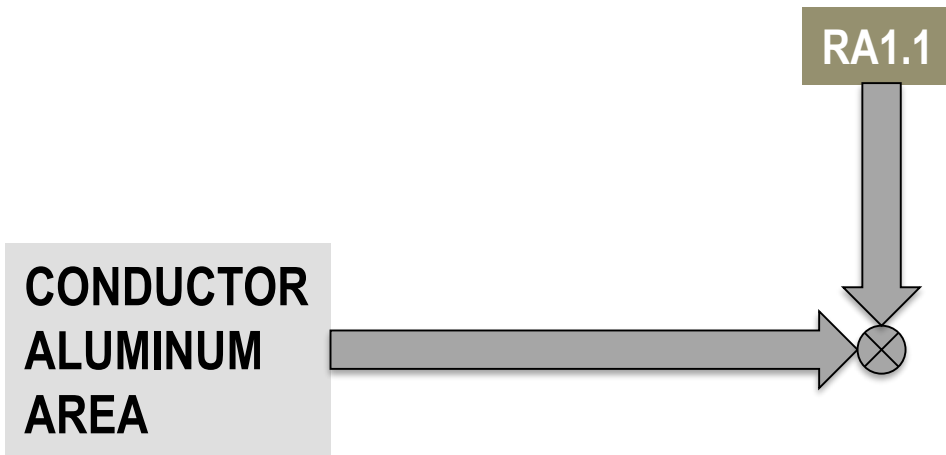
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**CONDUCTOR
ALUMINUM
AREA**

RA1.1



RA2.1

REDUCE ENERGY CONSUMPTION
Conserve energy by reducing overall operation and maintenance energy consumption throughout the project life cycle.

Line Design Perspective

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CONDUCTOR
ALUMINUM
AREA

RA1.1



RA2.1

REDUCE ENERGY CONSUMPTION
Conserve energy by reducing overall operation and maintenance energy consumption throughout the project life cycle.

Reduce power losses

Line Design Perspective

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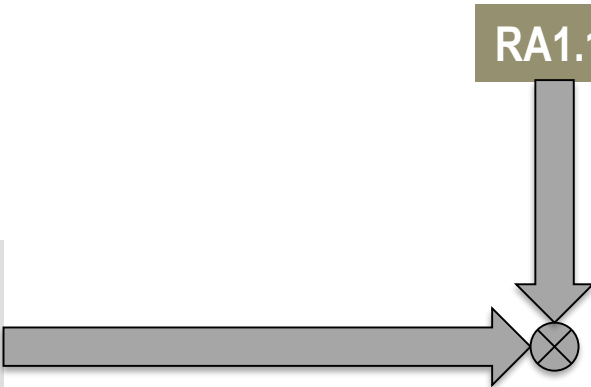
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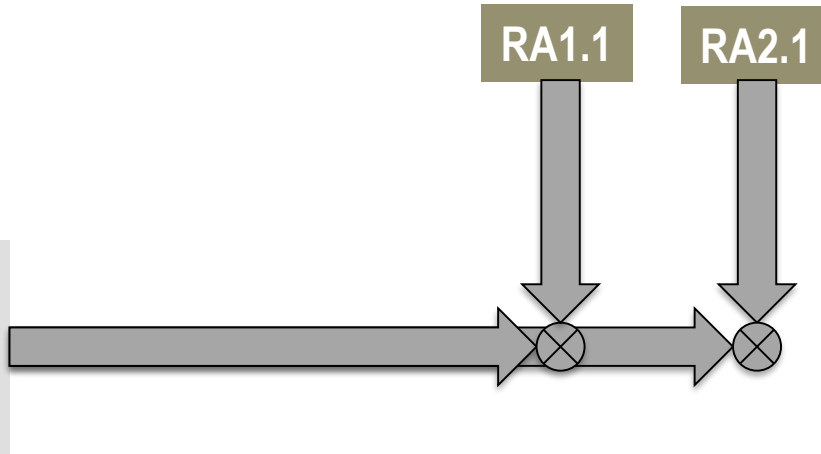
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RA2.1



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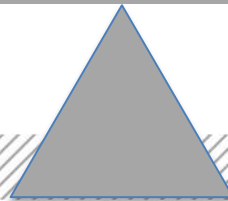
RA1.1

REDUCE NET EMBODIED ENERGY

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REDUCE ENERGY CONSUMPTION

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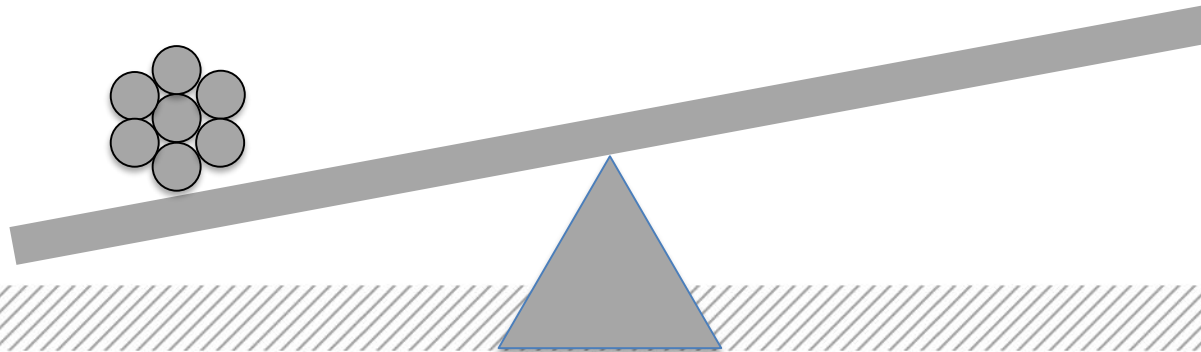
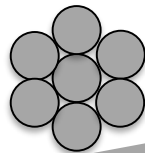
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REDUCE ENERGY CONSUMPTION

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ALUMINUM
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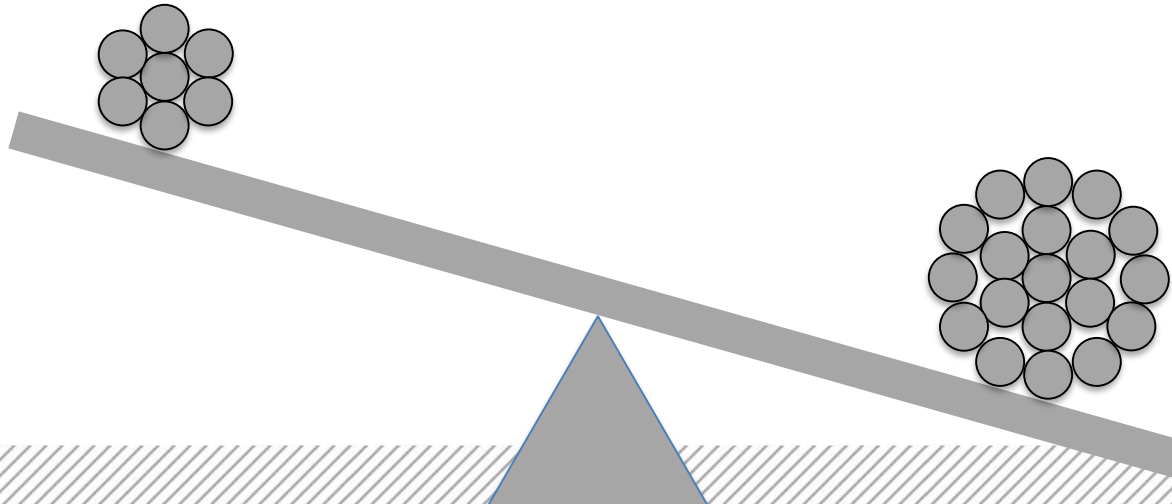
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REDUCE ENERGY CONSUMPTION

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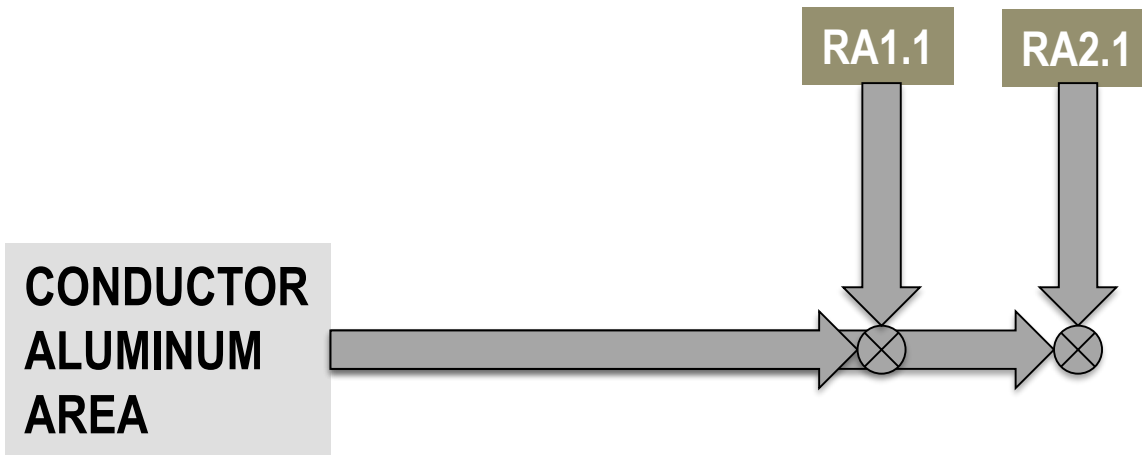


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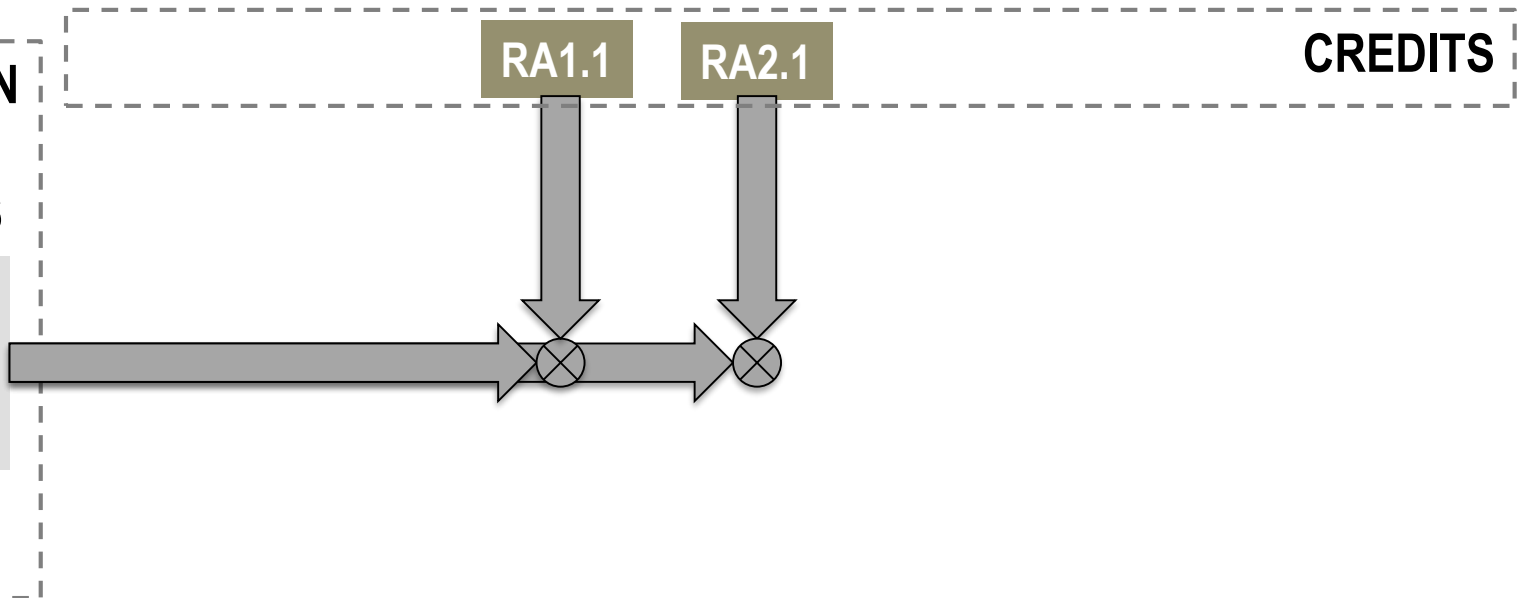
TRANSMISSION
LINE
PARAMETERS

CONDUCTOR
ALUMINUM
AREA

RA1.1

RA2.1

CREDITS



Line Design Perspective

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TRANSMISSION
LINE
PARAMETERS

CREDITS

50 PARAMETERS

CREDITS

Line Design Perspective

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TRANSMISSION
LINE
PARAMETERS

CREDITS

50 PARAMETERS

CREDITS



POWER
SUSTAIN EVAL

Our Vision

SD

Envision

T-Line SD

- **USE SUSTAINEVAL**
- **USE ENVISION**
- **ENGAGE WITH
INDUSTRY
PARTICIPANTS**



In Summary

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Questions?

Thank You!