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Guest Opinion:

How Asset Level Data Can Improve The Assessment Of Environmental Risk In Credit Analysis

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How Asset Level Data Can Improve The Assessment Of Environmental Risk In Credit Analysis

*(**Editor's Note:** The authors of this article are Director Ben Caldecott and Research Assistant Lucas Kruitwagen of the Sustainable Finance Programme at the University of Oxford. The thoughts expressed in this Guest Opinion are those of the writers and do not necessarily reflect the views of S&P Global Ratings.)*

The 21st Century will be increasingly defined by emerging and changing environmental risks and opportunities. Environmental risks are fundamental drivers of company and financial risk exposure for debt issuers. Asset level data build on disclosure regimes by providing physical and nonphysical asset level information tied to company ownership. The potential of asset level data to inform new analysis of environmental risk exposure is significant, including for the assessment of credit risk. These high-resolution data have the potential to improve the identification and analysis of environmental risk for analysts, investors, and other stakeholders.

Over the course of 2015 and 2016 the Bank of England (1), the Group of Twenty (G-20) Financial Stability Board (FSB) (2), and European Systemic Risk Board (3), among many other respected institutions, have all highlighted how a late and abrupt transition to a low-carbon economy could have implications for financial stability. They have emphasized the need to pre-emptively manage environmental risk in financial institutions, companies, and the financial system as a whole. Asset level data are needed to enable universal, detailed analysis of environmental risk exposure for issuers, guiding the efficient deployment of capital in the transition to a more sustainable economy.

Implications For Analysis Of Credit Risk

There are downside risks and upside opportunities associated with a changing environment and society's response to those changes; investors and analysts, generally, are concerned with the risks. As a subset of ESG (environmental, social, and governance) risks, environmental risks are becoming increasingly important in credit research that considers medium- and long-term investment horizons, the time frame over which management teams must proactively manage these risks. (For example, see "What A Carbon-Constrained Future Could Mean For Oil Companies' Creditworthiness," published on March 1, 2013, on RatingsDirect, and "Carbon Constraints Cast A Shadow Over The Future Of The Coal Industry," published on Aug. 15, 2015.) The understanding of environmental risk has expanded beyond the traditional limit of exposure to physical environmental changes (see table 1). This expanded typology shows that environmental risk is a fundamental driver of both the business and financial risk of issuers.

Table 1

Typology Of Environmental Risks And Opportunities

Class	Description and examples
Physical	
Environmental challenges and change	Climate change, water stress, and biodiversity loss.
Changing resource landscapes	Price and availability of different resources, such as oil, gas, coal, and other minerals and metals. For example, the shale gas revolution and phosphate scarcity.
Societal	
New government regulations	Introduction of carbon pricing (via taxes and trading schemes), subsidy regimes (fossil fuels, renewables), air pollution regulation, disclosure requirements, the "carbon bubble" and international climate policy.
Technological change	Falling clean technology costs (solar PV, onshore wind), disruptive technologies, and genetically modified organisms or GMO.
Evolving social norms and consumer behaviour	Fossil fuel divestment campaigns, product labeling and certification schemes, consumer preferences.
Litigation and changing statutory interpretations	Court cases, compensation payments, and changes in the way existing laws are applied or interpreted.

Note: See Caldecott, B., Howarth, N. & McSharry, P., (2013). "Stranded Assets in Agriculture: Protecting Value from Environment-Related Risks.," Smith School of Enterprise and the Environment, University of Oxford. Oxford, U.K.

Asset level data offer new opportunities for the analysis of environmental risk and its contribution to business and financial risk. At its core, asset level data enable granular analysis of environmental risk by measuring the exposure of assets directly, before then aggregating this information to the company level, revealing competitive differences among debt issuers.

The business risk profile of an issuer captures risk associated with its industry and country of operation and its competitive position relative to its peers. Environmental risk is causing entire industries to undergo transformation, for example by constraining demand for carbon-intensive products, or by reducing the pollution intensity of operations (see table 2 for highly exposed industries). Based on this, the competitive landscape will shift dramatically, potentially favoring entities that have lowered their risk exposure at the expense of those that haven't. Regulatory environments differ by country and can change rapidly as governments adopt new environmental policies; a highly predictable environmental regulatory framework is a credit strength. Firms that are better positioned to adapt to and benefit from these changing risks will enjoy a competitive advantage relative to their peers, reducing their baseline business risk. Additionally, operating efficiency is a significant driver of credit quality, and one that is increasingly impacted by environmental regulations. As an example, decreases in cash flow brought about by carbon pricing will disproportionally affect high-carbon and high fixed-cost generators such as coal assets, and increased spending on environmental retrofitting could lead to higher operating leverage. For companies with considerable fixed asset investments, like utilities, asset level data can allow investors to understand which assets might be a drag on cash flow in the future.

Environmental risks are drivers of financial risk for debt issuers. By fundamentally influencing demand and prices in markets, environmental risks can threaten the free cash flow of companies, reducing the ability of companies to service debt or make the necessary investments to manage or respond to environmental (and other) risks. Especially for

investment-grade issuers with (generally) a longer time horizon, the risks of cash flow attrition due to unmitigated environmental risks become more acute. Companies under cash flow stress for protracted periods may take on additional debt to maintain or adapt their strategies, increasing leverage and the risk of default, and even impairing recovery prospects should default occur. Environmental risks can also impair key ratios with additional balance sheet affects, for example by reducing asset values or increasing remediation liabilities.

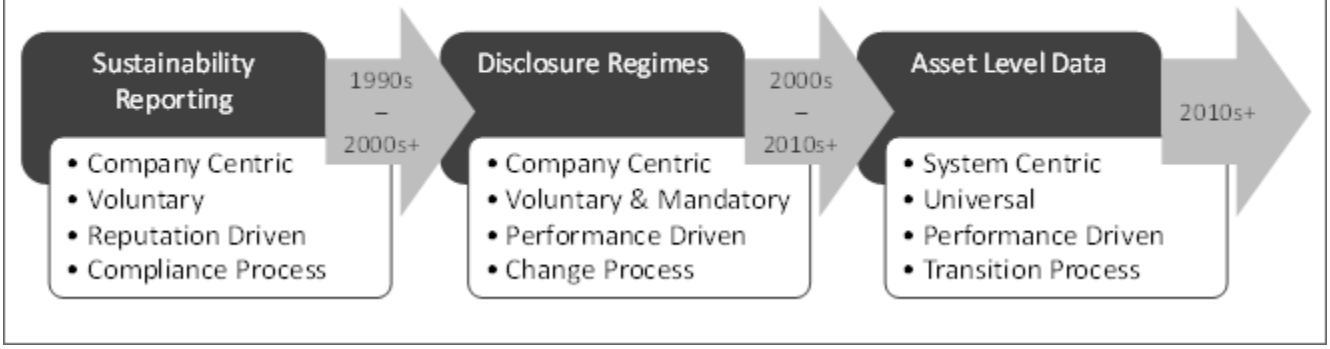
Ratings on issuers can be constrained to the analysis of data for which agencies have universal coverage, obtained, for example, via mandatory disclosure regimes. In contrast, asset level data for listed and non-listed companies, even in jurisdictions without effective disclosure regimes, can be found in local or national registries and public records, existing proprietary and nonproprietary databases, and company reporting to financial markets and regulators. This can enable universal coverage without mandatory corporate disclosure, though it requires asset level data to be brought together and effectively matched. The existing data can also be augmented by new sources of asset level data, such as remote sensing and big data. The potential for these new sources to transform the availability of accurate and near real-time asset level data at low cost are significant.

Universal coverage unlocks the inclusion of more sophisticated forms of analysis. Coverage of multiple industries could also enable analysts to consider industry-level cross-effects, such as competition for a limited carbon budget between oil and gas and coal extractive companies. Finally, due to the continual, rather than periodic, availability of asset level data, changes in environmental risk exposure can be used to inform analysts closer to real time, rather than on annual reporting cycles.

Current Approaches To Measuring Environmental Risk

Investors and other stakeholders currently obtain information regarding environmental risk through disclosure and reporting regimes. Disclosure regimes, both mandatory and voluntary, are making progress beyond dedicated sustainability reporting by demonstrating how improvements in environmental risk management are core to company performance. Reporting platforms like the CDP (5) and GRI (6) have made progress in attracting voluntary data disclosure from a large number of companies (for how the availability of environment-related risk data have evolved, see table 1).

Chart 1
The Evolution Of Environment-Related Risk Data



Environmental disclosure provides a basis for dialogue between investors and disclosing companies, driving incremental progress on requested indicators. This reporting has made great progress in establishing the profile and understanding of environmental risks among debt issuers. This process is limited, however, by a narrow focus on certain metrics, such as corporate greenhouse gas emissions at the parent company level, omitting many important aspects of environmental risk (for example, exposure to water scarcity, ecosystem service dependence, and competition from emerging low-carbon technologies). Such reported data are also immediately out of date and annual reporting cycles are slow; voluntary reporting does not have universal coverage and is unlikely to ever secure such coverage; and reporting and verification of metric indicators like carbon intensity are burdensome and expensive.

Asset level data provide bottom-up and forward-looking outlooks of company performance, give transparent information about company assets, and can be made more efficient and timely than annual reporting cycles. The high-resolution data do not supplant disclosure regimes, but rather supplement reported data where additional resolution is necessary and useful. By connecting assets with company ownership information, asset level data build the critical link between the real and financial economies, allowing market stakeholders to assess exposure to and the potential impact of environmental risks.

Potential Of Asset Level Data

Asset level data are the building blocks that can enable extensive analyses of many forms of environmental risk and opportunity. Asset level data do not preclude company-level analysis; Asset attributes can be aggregated by company to obtain company-level views of risk exposure. Asset level data are not needed for all industry sectors, just those highly exposed to environmental risk (see table 2). In many cases it is just data on physical assets that are required, however, nonphysical asset level data such as human capital, intellectual property, or reputational capital could become of interest in the future.

Table 2

Sectors Highly Exposed To Environmental Risk
Oil and gas
Coal
Metals and mining
Agriculture and forestry
Power
Automotive
Aviation
Marine
Cement and steel
Clean technology
Real estate

Credit risk analysis using asset level data could benefit in these ways:

- Bottom-Up: Asset level exposure is aggregated up to the company level rather than inferred from company-level reporting.

- Fundamental: Fundamental asset attributes (for example, location, technology, and age) inform analysis rather than disclosed metrics (for example, carbon intensity) enabling more sophisticated and flexible analysis.
- Comparable: Standardization can ensure accurate company comparisons and avoids embedded methodological assumptions.
- Forward-looking: Asset attributes (such as age) can enhance analysis of company future performance and enable validation of company projections.
- Efficient: It can significantly reduce reporting burdens and reduce time and money spent on assuring voluntary disclosures.
- Timely: Asset level data can be updated in real time as events occur (like mergers or asset commissioning) rather according to annual reporting cycles.
- Transparent: Asset attributes are transparent and are based on real observational data, giving stakeholders access to the same data as company executives.
- Scalable: The marginal costs of data acquisition and analysis decrease with scale of the dataset.
- Science-driven: Unlocks scientific approaches to analysis which are repeatable, testable, and methodological.
- Unbiased: Opinions of environmental factors informed by asset level data do not rely on the (non-expert) opinions of corporate boards.
- Self-improving: Science and technology-driven risk analysis and data acquisition improve continuously with new generations of technology and research. Costs also reduce over time.

Focusing on fundamental attributes (for example, boiler technology and capacity) rather than composite indicators (like tCO2/MWh) allows flexibility as the understanding of environment-related risk exposure improves. Even the simple disclosure of asset location attributes unlocks forms of spatial analysis, including the cross-referencing of geospatial and environmental change datasets (see the case study below). Table 3 provides examples of the asset types and attributes that may be useful for assessing environment-related risk exposure of power utility companies or real estate investment trusts. Box 1 describes sources of asset level data.

Table 3

Asset Level Data Attribute Examples

	Power utility	**Real estate investment trust**
Asset	**Per power station**	**Per property**
Nameplate		
	Name	Name
	Location (lat/lon)	Location
	Ownership	Ownership
	Age	Age
Activity		
	Nominal capacity (GW)	Nominal capacity (units)
Technology		
	Power generation (MWh/Yr)	Tenancy (%)

Sources Of Asset Level Data

A wide array of asset level data already exists. These data are categorized according to whether they are structured and unstructured. Structured data are organized (as in a database or spreadsheet), and are easily queried and manipulated. Unstructured data exist in small pieces across the Internet, or even in media or embedded in remote-sensing images.

Industry databases have been the traditional source of asset level data for the financial industry. This information is typically sold by private firms as part of their business model. These databases may or may not include information related specifically to physical assets such as location or technology employed. In addition to such industry databases, a variety of climate-relevant government data are available from national statistics authorities. For example, such information includes mandatory GHG reporting data (EU ETS, US EPA, etc.), some types of GHG inventories, and air and water pollution permits. While these data are generally backward-looking and can lack ownership information, they can also serve as an important complement to industry databases, connecting assets to emissions and filling in data gaps. In fact, many industry databases already draw from government statistics and corporate disclosure sources in compiling their commercial products.

NGO and academic datasets are developed by researchers in around the world – kept on hard drives and servers, or even paper publication archives. Although these publications are often publicly available, their disparate locations have prevented their use in credit analysis.

Corporate disclosure data at company level (both mandatory and voluntary, financial and nonfinancial) also have a role to play, offering aggregated totals of environmental indicators (for example, greenhouse gas or GHG emissions) and financial data. There is considerable variability in how thorough this reporting currently is and environmental indicators are often unverified. Investors and other stakeholders may call on companies to disclose certain types of asset level data relevant to the salient areas of environmental risk they identify. Disclosure of asset level data might be seen as a corporate analog to the disclosure of holdings data of financial institutions.

Unstructured data offer great promise for the future of data creation. New machine learning and artificial intelligence techniques can scan vast amounts of unstructured data to identify assets and their attributes, and associate them with their owner companies.

The Necessary Task Of Building Asset Level Datasets

In the absence of perfect reporting, it is necessary to build asset level datasets to provide universal coverage and open up more sophisticated bottom-up approaches to measuring environmental risk. The good news is that much of the data required to undertake this already exist. It's just in disparate locations and needs to be brought together and can be augmented with remote sensing and big data datasets. This is an awkward task, but not a particularly expensive one. It also lends itself to being a coordinated public goods endeavor. Analysts would benefit from asset level data to better inform their opinions of credit risk, and would do well to encourage such efforts.

Appendix: A Case Study Into Environment-Related Risks In The Global Thermal Coal Value Chain

This case study is taken from "Stranded Assets and Thermal Coal: An analysis of environment-related risks," a technical report by the Sustainable Finance Programme at the University of Oxford, supported by Norges Bank Investment Management (NBIM) (7).

In January 2016, the Sustainable Finance Programme published the results of a technical study of environment-related risks in the global thermal coal value chain. The study developed 36 hypotheses of environment-related risk exposure in the leading companies in the thermal coal value chain: The top 100 coal-fired utility companies by coal-fired power generation; the top 20 thermal coal-mining companies with more than 30% of total revenue derived from thermal coal mining; and the top 30 coal-processing technology companies by normalized syngas (synthesis gas) production (collectively the "top thermal coal companies").

Asset level datasets were developed for each company in the top thermal coal companies: coal-fired power stations for the utility companies, coal mines for the mining companies, and coal-processing facilities for coal-processing technology companies. This case study presents how asset level data enabled a higher-resolution opinion of environment-related risk exposure for Entergy Corp., which was chosen for this example due to their small number of plants with diverse environment-related risk exposure. Entergy, a U.S. company, is also subject to number of disclosure regulations, providing a global example of the best data availability. This case study shows how adding only two additional fields of asset level data enables a wide array of additional analysis of environment-related risk indicators. S&P Global Ratings rates Entergy Corp. 'BBB+' with a stable outlook. The investment-grade rating and stable outlook are in part due to Entergy's long-term management of regulatory risk, such as that imposed by changing environmental regulations. (See "Entergy Corp And Subsidiaries Issuer Credit Ratings Raised to 'BBB+'; Outlook Stable," Aug. 4, 2016.)

Entergy Corp is a U.S. utility company with operations in Arkansas, Louisiana, Mississippi, and Texas. Entergy has three coal-fired power stations: Independence, White Bluff, and Roy S. Nelson. Analysis may examine the coal-fired power stations of a utility company to identify the company's total exposure to environment-related risk, but can also allow investors to understand how changes to those specific assets could weigh on metrics and ratings over time.

Entergy regularly submits data to CDP, scoring in the 'A' performance band since 2013 (although declined to submit to CDP in 2016). Entergy's integrated reporting includes some asset level data, reported under the U.S. Environmental Protection Agency's Mandatory Reporting Rule. Table 4 shows the data available from Entergy's integrated reporting.

Table 4

Data Table: Disclosure Regimes

	Independence PS	White Bluff PS	Roy S. Nelson PS
Stock ticker	NYSE: ETR		
Equity ownership	0.48	0.57	0.81
Coal-fired capacity (MW)	1677	1660	476
CO2 emissions (kt)	10430	10805	2915

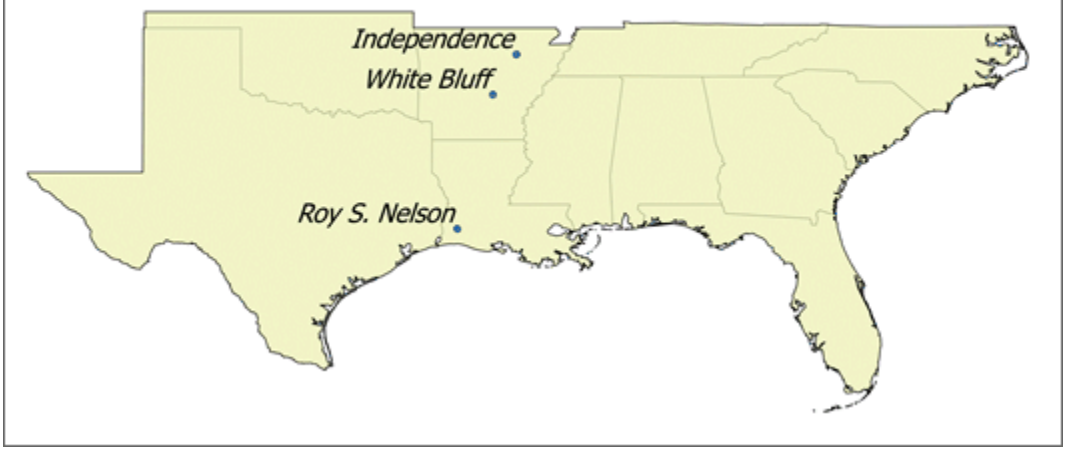
Additional asset level data can provide further insight into Entergy's environment-related risk exposure. In this case study, two additional pieces of asset level information, location and emissions, allow the creation of an abundance of new data fields for analysis. Five examples are given.

Additional asset level data

1. Power Station Location

The locations of Entergy's coal-fired power stations are obtained from Google Inc. (8) Chart 2 shows the locations of Entergy's coal-fired power stations in the southern U.S.

Chart 2
Coal-Fired Power Stations Owned By Entergy Corp.



2. Power Station Emissions Rate

The emissions rate (in kg CO2e/MWh) for Entergy's power stations are obtained from Carbon Monitoring for Action (CARMA) (9) , which maintains a database of global coal-fired power station emissions rates through 2012 (data available for Roy S. Nelson only until 2009).

Additional analysis: examples

A. Annual Generation

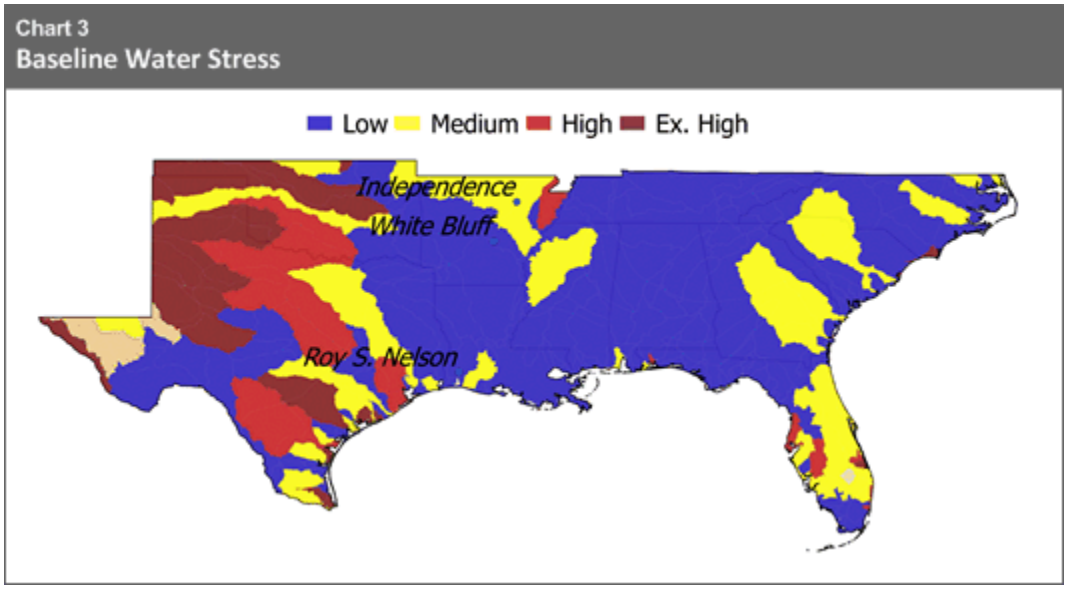
Using peer-reviewed estimation methodologies and CO2 emissions reported by Entergy, total annual generation (in MWh) for the power station can be calculated. It may be useful for investors to know the total generation of a power station to assess its importance in the generating fleet of the utility company.

B. Utilization Rate

From annual generation (in MWh) and total capacity (in MW), the utilization rate of the power station is able to be calculated. The utilization rate is a measure of asset productivity, describing the total generation of a power station as a fraction of the maximum possible annual generation.

C. Baseline Water Stress

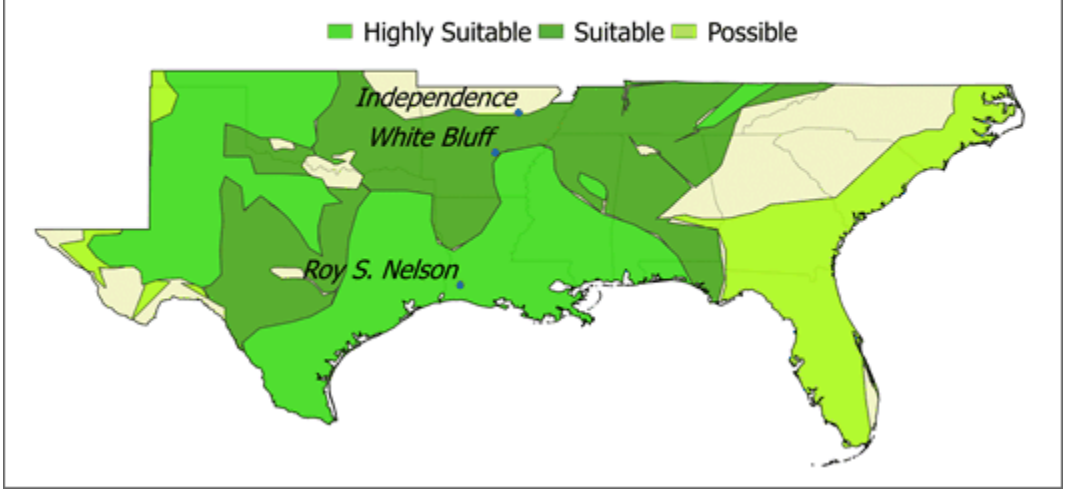
Thermal power stations have large water footprints for cooling loads. Baseline water stress describes the amount of water demand in a water basin relative to the amount of renewable water resource available in that basin. Low water stress indicates an abundance of water. A geospatial dataset for baseline water stress was obtained from the World Resources Initiative's Aqueduct, see Figure 3.A. (10)



D. CCS Geological Suitability

Carbon capture and storage (CCS) retrofits may become an option to extend the life of coal-fired power stations while reducing GHG. CCS is limited by (among other things) the local availability of suitable geological storage. A geospatial dataset for CCS geological suitability was obtained from the IEA Greenhouse Gas R&D Programme, see Figure 3.B. (11)

Chart 4
Carbon Capture And Storage Geological Suitability



E. Future Heat Stress

Heat stress is the average temperature increase over pre-industrial levels. Heat stress can cause decreases in power station efficiency and extreme weather can threaten operations. A geospatial dataset for heat stress from 2016 to 2035 was obtained from the Intergovernmental Panel on Climate Change, see Figure 3.C. (12)

Chart 5
Future Heat Stress

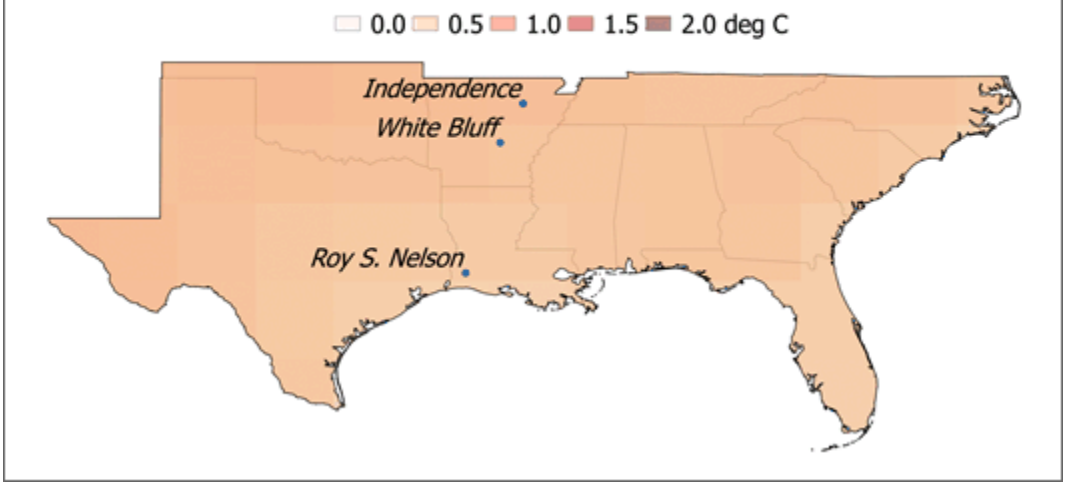


Table 5

Data Table: Disclosure Regimes Plus Additional Asset Level Data

Power station	Independence	White Bluff	Roy S. Nelson
Stock ticker	NYSE:ETR		
Equity ownership (MW)	0.48	0.57	0.81

Table 5

Data Table: Disclosure Regimes Plus Additional Asset Level Data (cont.)

Power station	Independence	White Bluff	Roy S. Nelson
Coal-fired capacity	1677	1660	476
CO2 emissions (kt)	10430	10805	2915
Additional asset level data			
Location (lat/long)	35.672/-91.408	34.419/-92.141	30.242/-93.251
CO2 emission rate (kg CO2e/MWh)	1060	1050	1080
Additional analysis			
Annual generation (GWh)	9840	10291	2699
Utilization rate	0.67	0.71	0.65
Baseline water stress	<Medium>	<Low>	<Low>
Carbon capture and storage geologic suitability	<Unknown>	<Suitable>	<Highly Suitable>
Future heat stress (oC)	0.82	0.74	0.66

Note: See Caldecott, B., Howarth, N. & McSharry, P., (2013). Stranded Assets in Agriculture: Protecting Value from Environment-Related Risks., Smith School of Enterprise and the Environment, University of Oxford. Oxford, UK.

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