

# DOE Bioenergy Technologies Office (BETO) 2023 Project Peer Review

## 4.1.1.40 Energy Equity in the Transition to Renewables: The Bioenergy Case

April 5, 2023

Data, Modeling, and Analysis

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ORNL is managed by UT-Battelle LLC for the US Department of Energy

## Oak Ridge National Laboratory



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## National Renewable Energy Laboratory



Patricia Romero Lankao, Co-PI,  
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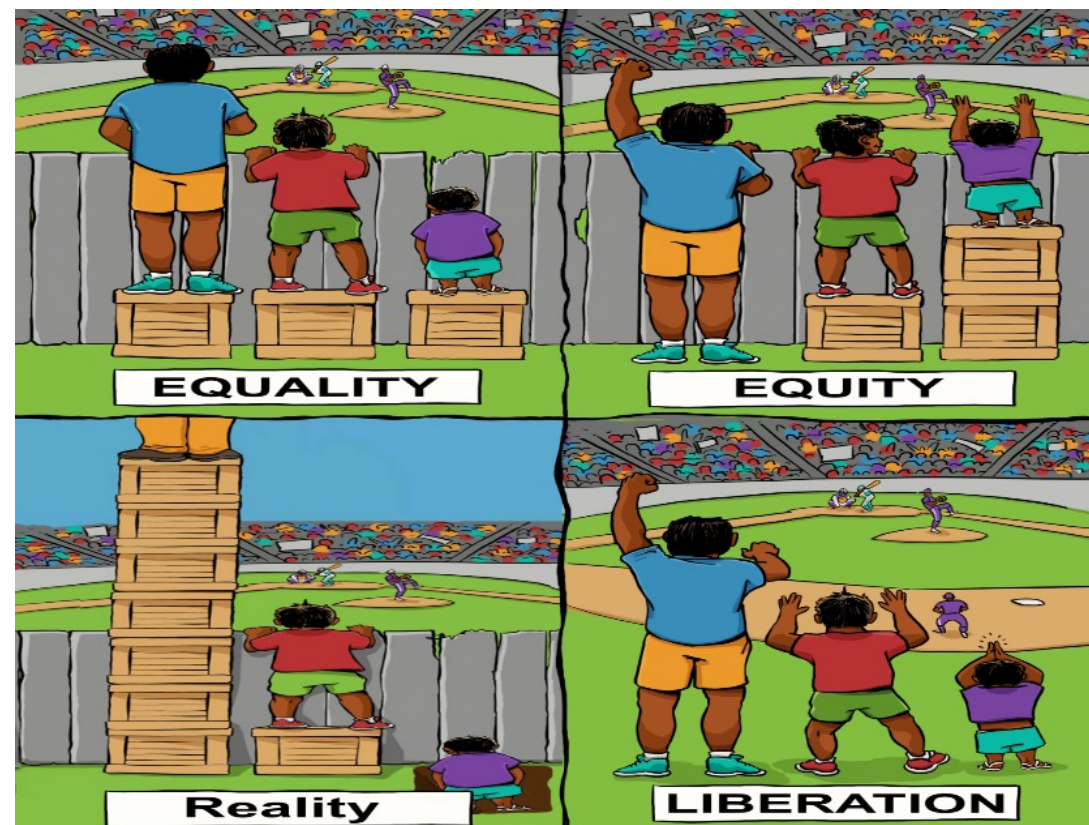


Nicole Rosner  
justice, community engagement,  
social science, transportation

# Project Overview— Personnel

# Project Overview—Context, History, and Goals

- FY22 response to request for proposals from Bioenergy Technologies Office (BETO) for
  - Metrics to assess diversity, equity/justice, and inclusion (DEI)
  - Inventory of BETO R&D that supports DEI
  - Suggestions for how DEI could be incorporated into existing work or new activities that could improve DEI
  - 1-year project
- Our proposal focused on
  - Stakeholder involvement
  - Equity/justice
  - Siting bioenergy



[https://medium.com/@sandeepkumar\\_52041/equality-equity-and-justice-5f71ebe31245](https://medium.com/@sandeepkumar_52041/equality-equity-and-justice-5f71ebe31245)

# Project Overview—Context, History, and Goals

Project is responsive to Administration goals

- **Executive Order 13985.** Advancing Racial Equity and Support for Underserved Communities through the Federal Government
  - Federal government advances equity for all (people of color, impoverished). Departments must redress inequities in programs.
- **Executive Order 14008.** Tackling the Climate Crisis at Home and Abroad
  - Clean energy economy creates well-paying union jobs and turns disadvantaged communities into healthy, thriving communities (acknowledging past injustice)
- **Justice40 (under EO 14008)**
  - 40% of benefits of clean energy flow to disadvantaged communities



2014 People's Climate March through Manhattan, New York, USA, Getty images, istock, Andrew Parker

# Project Overview—Tasks

How do we measure/model justice for bioenergy siting scenarios?



Bioenergy justice indicators

How is BETO doing? What areas are covered in justice research? What are the justice research gaps?



Inventory of BETO justice tasks

How do we engage with communities when making decisions about large energy projects?

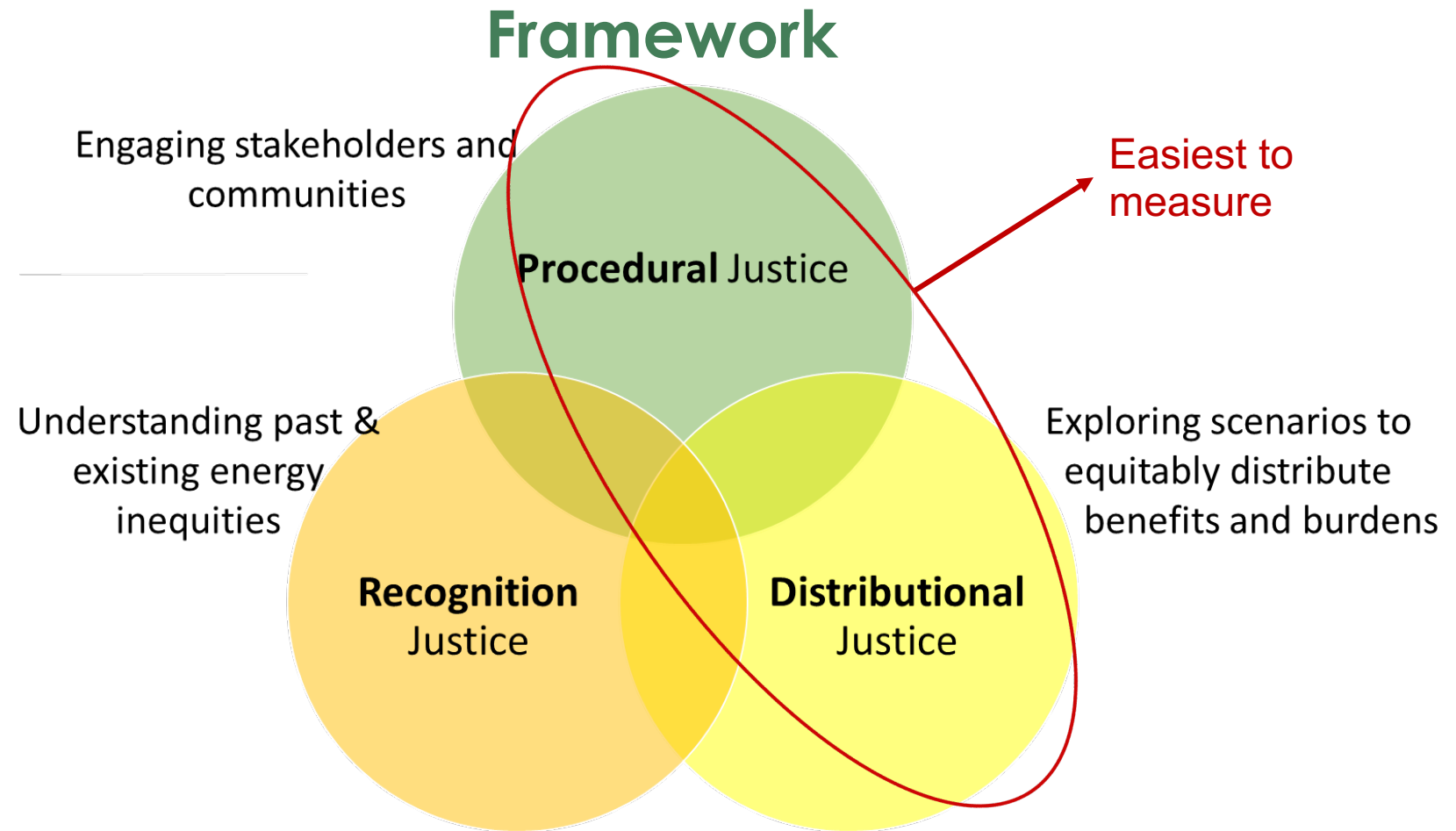


Best practices for community engagement

# 1 – Approach—State of the Art for Energy Justice Research

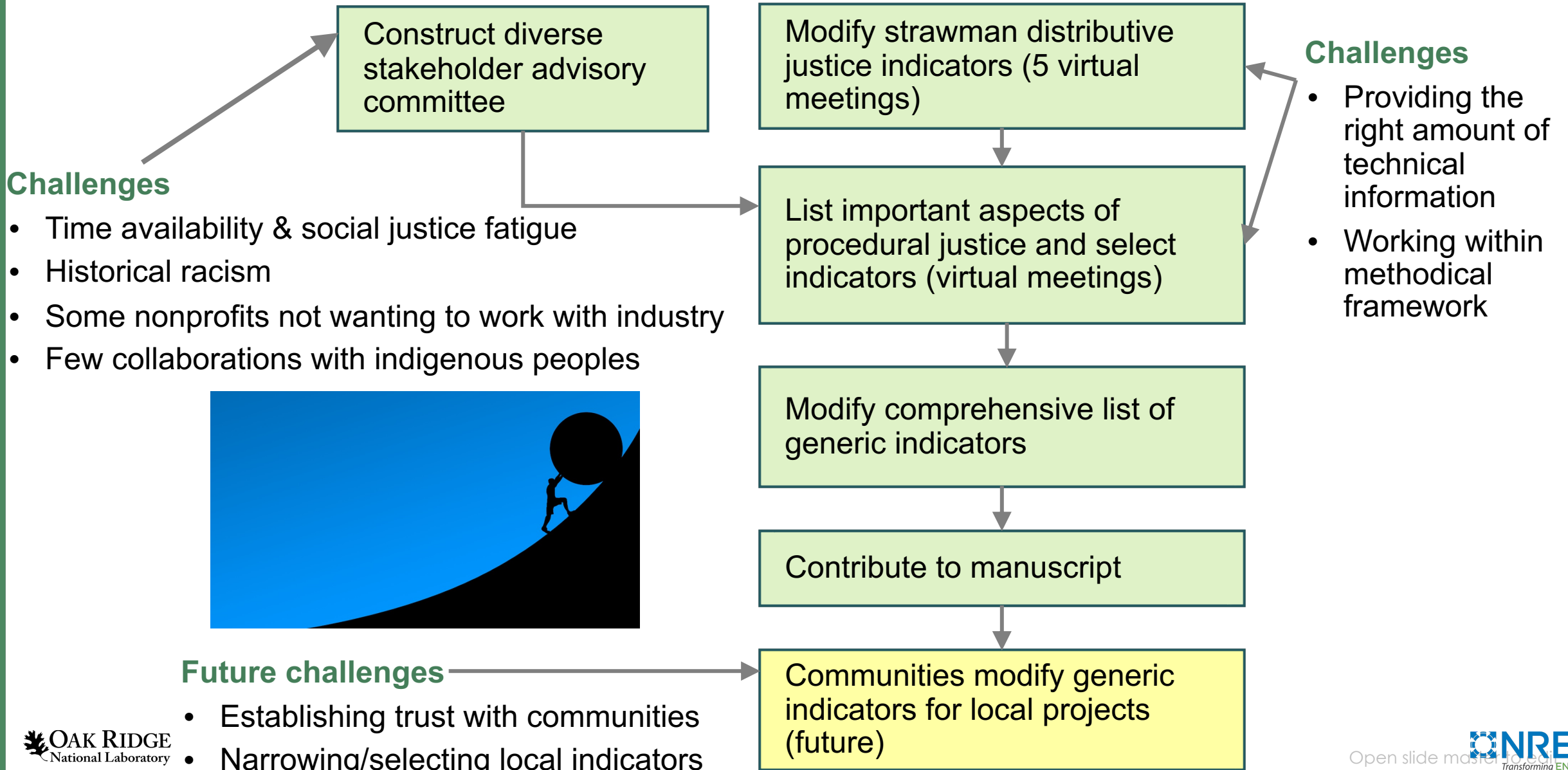
## State of the Art (literature)

- Definitions and frameworks for types of energy and environmental justice
- Definitions of disadvantaged or underserved people
- Energy justice metrics produced by academics and by federal agencies and state governments (procedural and distributive)
- Energy justice concerns of stakeholders/communities



**Need** –Justice in the context of bioenergy, community best practices related to justice and bioenergy, stakeholder involvement

# 1 – Approach—Justice Indicators and Challenges

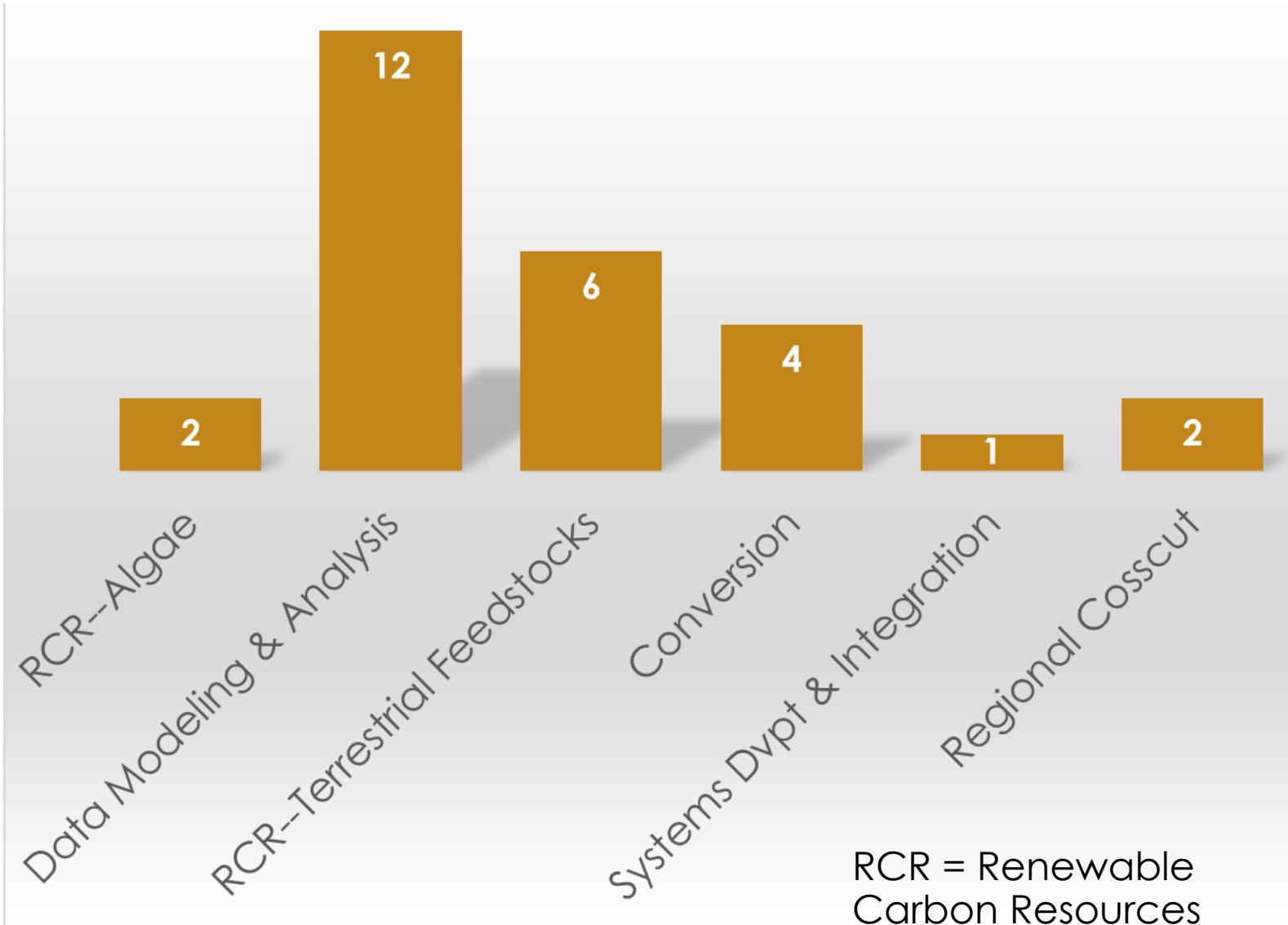


# 1 – Approach—Strawman Example Indicators of Bioenergy Justice

Type	Category	Objective	Example indicator
Procedural justice	Participation	Determine whether all relevant stakeholders are represented	Percentage of key organizations and communities providing input
	Responsibility	Enable stakeholder/community leadership	Stakeholders/communities holding leadership roles in councils or committees
	Influence	Determine effectiveness of stakeholder participation	Percentage of decisions on which stakeholders feel they had real input
Distributional justice	Social well being	Meet employment targets, equitable employment	Employment
	Social well being	Meet energy security targets, equitable energy security	Energy burden
	Social acceptability	Social acceptability (average and across demographic groups)	Percentage of acceptance among populations
	Air quality	Meet health criteria, visibility	Total particulate matter less than 2.5 $\mu\text{m}$ diameter



# 1 – Approach—Justice Opportunities in Bioenergy Research Portfolio



## Questions asked of project PIs

- Environmental or energy justice task?
- Measure or model indicators in spatially explicit way to be linked to disadvantaged populations?
- Link to land management policies that affect disadvantaged populations?
- Model reference scenario with disparate effects on disadvantaged populations?
- Stakeholder engagement or outreach?
- Minority or disadvantaged partners?
- Case study on underserved region?

Full questions in Appendix

# 1 – Approach—Best Practices for Community Engagement: Literature Review Paper

Strategic literature search – using terms such as engagement, energy equity, transitions, social acceptance

Analytic framework: who promotes/is excluded, in what energy projects and processes, for what (equity) goals, with what outcomes

Guiding questions: focused on methods & data, framings & concepts, and findings on engagement & energy equity in transition to renewables

# 1 – Approach—Routes for Communication/Collaboration

- Portfolio review
  - National laboratories described justice and stakeholder engagement tasks to us
- Justice indicators
  - Stakeholder advisory committee collaborated on indicator development and journal article
- Other related projects
  - We leverage project results for Stakeholder Concerns task, Bioenergy in Appalachia, Hydropower Diversity Equity and Inclusion (Water Power Technologies Office), Rural and Remote Communities (Office of Clean Energy Demonstrations), Just Transitions (Net Zero World Initiative), Workshop on Energy Justice and Climate Justice in the South (ORNL Climate Change Sciences Institute)
- Workshops, conferences, and webinars
  - DOE Energy Efficiency & Renewable Energy Office, DOE Office of Economic Impact and Diversity, Energy Futures Initiative, Resources for the Future, Sloan Foundation, Deep South Center for Environmental Justice, U Michigan Energy Equity Project, Initiative for Energy Justice



# 2 – Progress and Outcomes—Stakeholder Advisory Committee



**Bill Belden**  
Antares Group



**Will Bryan**, Southeast  
Energy Efficiency Alliance



**Dave Effross**  
AFL-CIO



**Berneece Herbert**  
Jackson State U.



**Renee Hoyos**  
Virginia DEQ



**Cassandra Johnson  
Gaither**  
USDA Forest Service  
National Laboratory



**Ariel Kagan**  
Environmental  
Initiative



**Stacie Peterson**  
National Center for  
Appropriate Technology



**Tequila Smith**  
Georgia Power

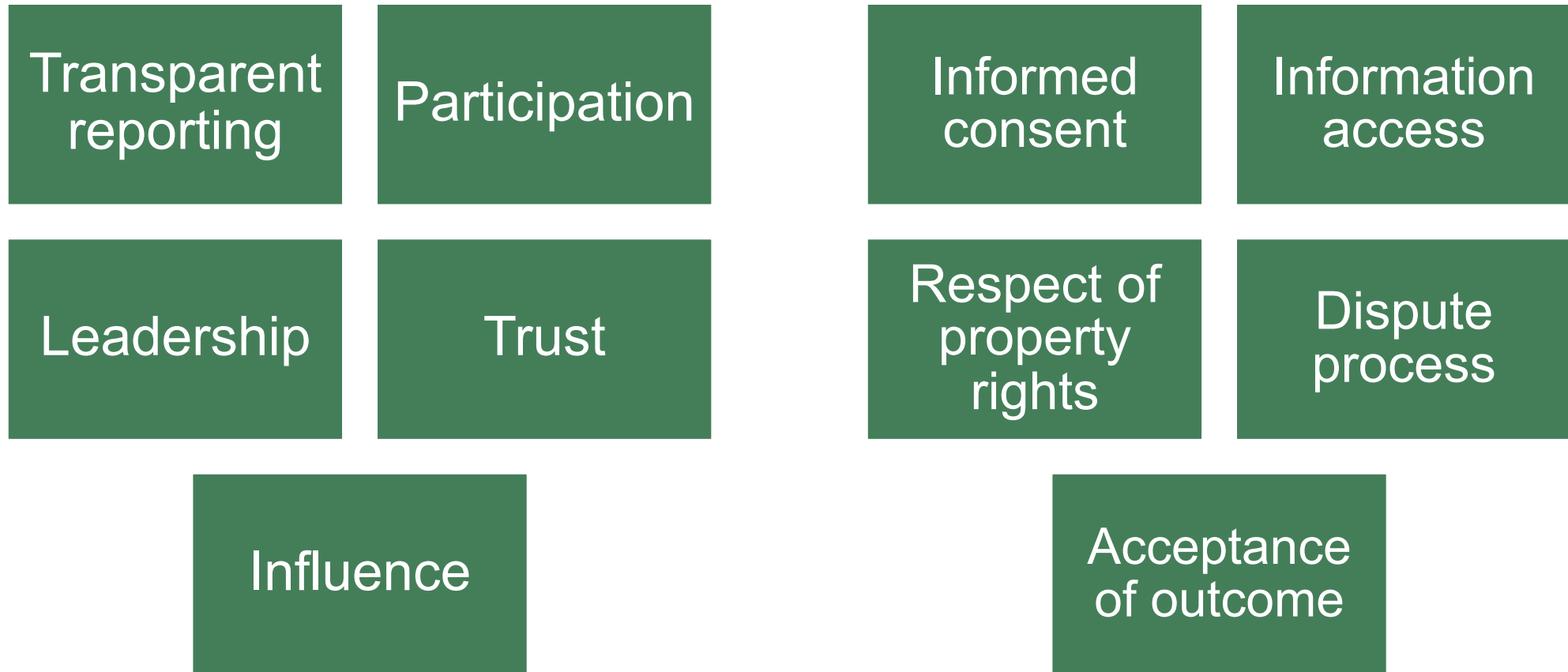


**Floyd Vergara**  
Clean Fuels  
Alliance America

OpenSlide Hub for CC-BY

## 2 – Progress and Outcomes —Justice Indicators

### Categories of Procedural Justice Indicators



*List of indicators in  
Appendix*

# 2 – Progress and Outcomes—Justice Indicators

## Categories of Distributive Justice Indicators

### Social well-being

Health and safety

Resource access + affordability

Employment

Labor rights

Education + training

Traffic

Aesthetics

### Corporate well-being

Profitability

### Environment

Water quality

Air quality

Water quantity

Biodiversity

Soil quality

*List of indicators in Appendix*

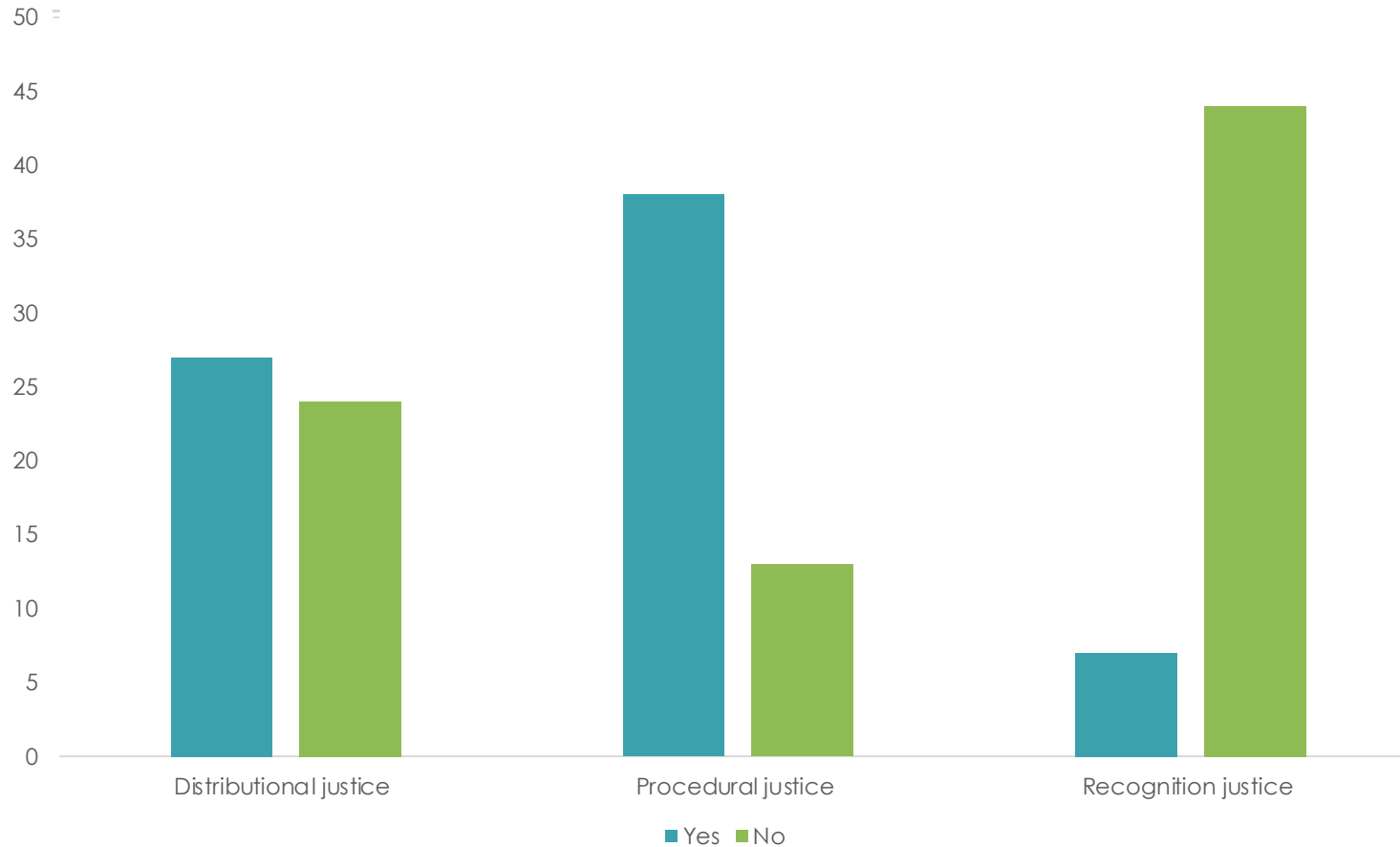
# 2 – Progress and Outcomes—Community Engagement & Equity in Energy Projects—Review Paper

Type of Method	Total	Geographic Area	Total	Energy Category	Total	Direction	Total
Toolkit	1	International	10	Bioenergy	9	Best Practices	17
White paper	11	Europe	14	Energy Technologies	14	Social Acceptance	19
Case study	5	North America	17	Renewable Energy	12	Energy Democracy	8
Survey	3	Australia	2	Solar	4	Regional Development	8
Qualitative	12	Africa	2	Wind	10		
Guidelines	15	Latin America	4				
Literature Review	8	Asia	2				
Mixed Methods	1						

Note: some papers use more than one type of method.

# 2 – Progress and Outcomes—Community Engagement & Equity in Energy Projects—Review Paper

## Studies Targeting Justice Tenets



- ❖ Few engagement studies in bioenergy
- ❖ Multiple factors shape acceptance
- ❖ Instrumental one-way approaches
- ❖ Engagement doesn't necessarily improve equity



# 2 – Progress and Outcomes—Portfolio Review Examples

(Planned to inventory 10 projects; inventoried 25)

## Generate justice indicators

- Energy Equity in Transition to renewables (ORNL)
- Economic Analysis of Market Conditions and Incentives . . . (some from White House Council on Environmental Quality's Climate and Economic Justice Screening Tool)

## Adopt justice indicators from this project

- Appalachia Analysis (project ended)
- Benefits and Land Use Effects of . . . Carbon Banking

## Generate indicators of disadvantaged communities

- Economic Analysis of Market Conditions and Incentives . . .

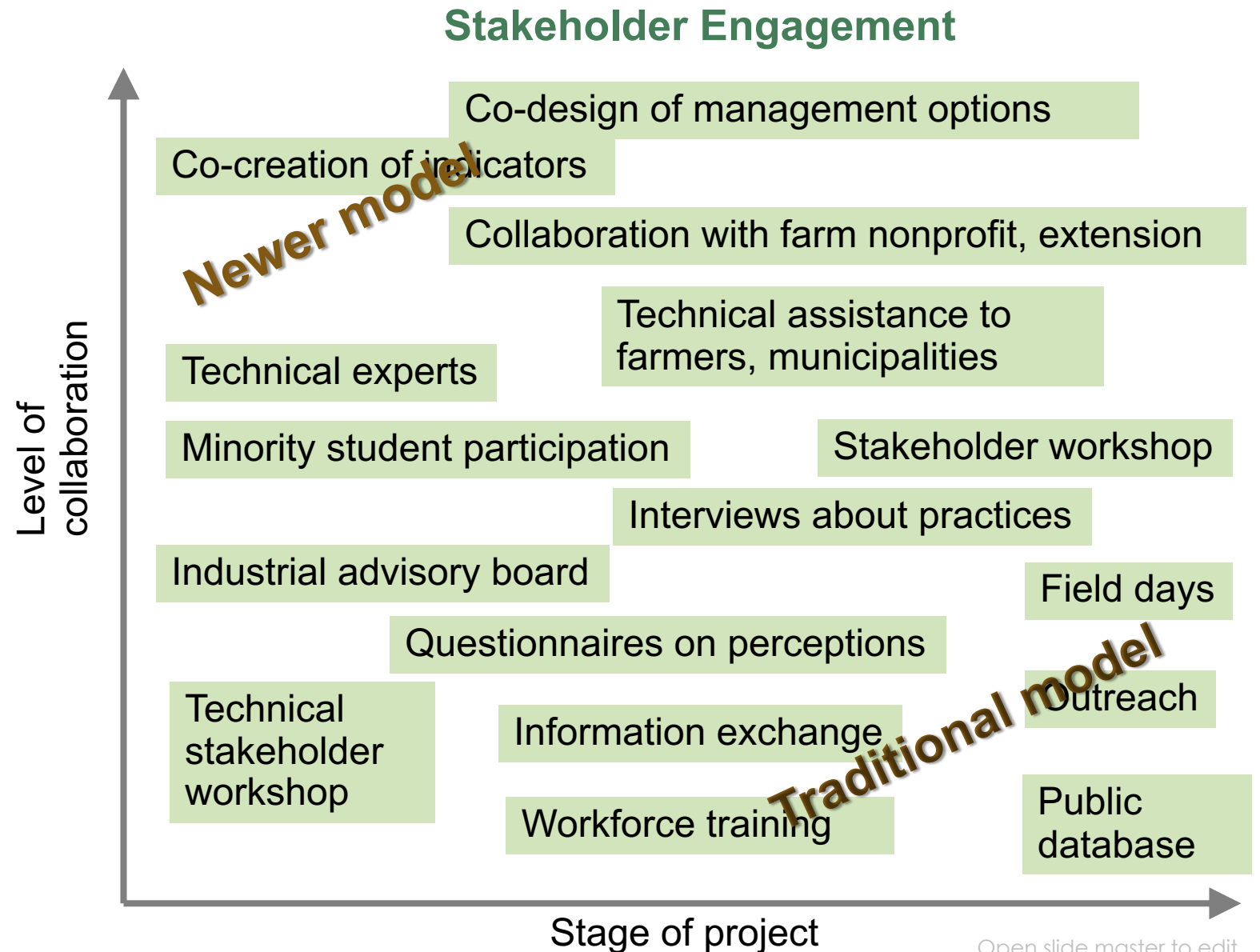
## Model justice indicators under different pathways

- Triple Bottom Line Sustainability Indicators for [waste to energy]
- Getting to Zero Report
- Geospatial Analysis of Ecosystem Service Portfolios
- Biofuels Air Emissions Analysis
- Bio-Cradle-to-Grave Model for Rapid . . .

# 2 – Progress and Outcomes—Portfolio Review

## Stakeholders represented in projects funded by BETO

- Farmers and farmer organizations
- University extension
- Minority serving educational institutions
- Local and state government
- Federal agencies (USDA, EPA, Federal Aviation Administration, Forest Service)
- Energy utilities
- Aviation organizations
- Bioenergy industry
- Environmental nonprofits
- Energy nonprofits
- Labor unions
- Communities



# 2 – Progress and Outcomes—New Research Directions from Portfolio Review

- **Researcher collaboration**
  - Community of practice
- **Methods**
  - Approaches for quantifying distributional benefits & adverse effects of BETO research
- **Analysis**
  - Regional feasibility of energy crops (energy cane, switchgrass)
  - Analysis of understudied justice indicators (e.g., energy burden)
  - Policy analysis in context of needs of disadvantaged communities and market demand
  - Baseline distributional effects for petroleum or coal facilities
- **Technology development**
  - Small-scale, distributed bioenergy for rural/remote communities
  - Air pollution monitoring/modeling in disadvantaged communities near bioenergy facilities
- **Social science**
  - Factors determining social acceptability of bioenergy (including with C capture and storage)
  - Factors determining bioenergy success/failure in indigenous communities
- **Case study**
  - Distributional justice and biomass/bioenergy potential in disadvantaged region

Met go/no-go decision point—Provide BETO with at least 3 new research directions, June 2022

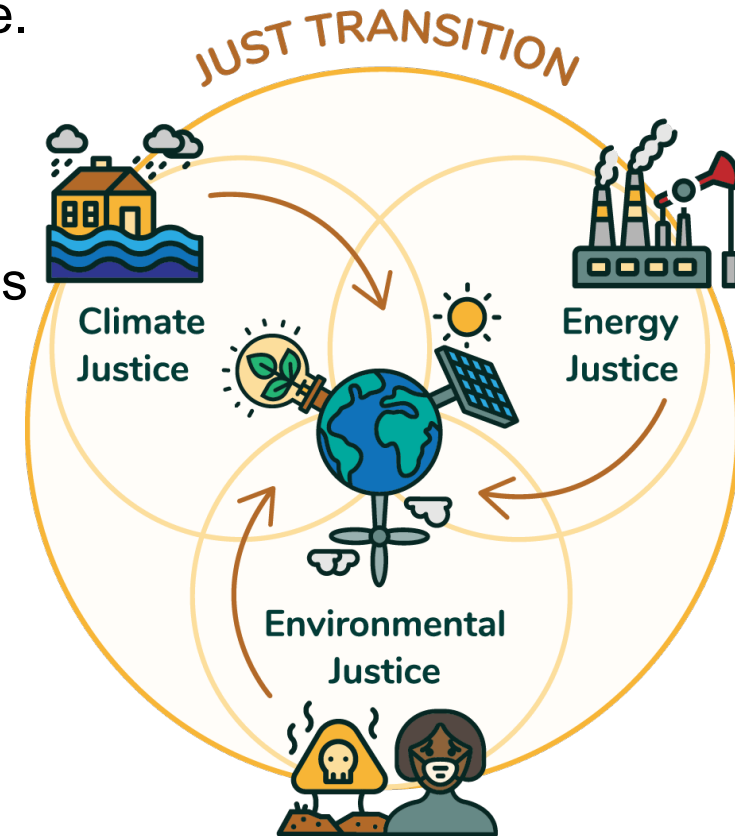
# 3 – Impact—Future Research & Assessment



- **Proposed work for next 1.5 years**
  - **For BETO.** Provide/implement methods and metrics to measure progress of research portfolio toward Justice40. (Flexibility to incorporate methods of others is important.)
  - **For researchers.** Develop community of practice for BETO justice-focused projects with bimonthly meetings.
  - **For underserved community.** Develop case study on bioenergy.
    - Forest biomass, regional energy crops, or waste biomass
    - Biomass production potential mapped with a few justice indicators
    - Location-specific advisory group
    - Policy scenarios to secure market demand
  - **For society.** Evaluate utility of community benefits agreements for justice.

# 3 – Impact

- **Increase social acceptability** of bioenergy by improving procedural justice and developing tools to assess and remedy distributive injustice.
- **Empower communities** with indicators they can modify and good engagement practices.
- **Mutually influence perspectives of stakeholders** involved in process
  - Committee members ↔ BETO
- **Move toward Justice40** with justice indicators that
  - Can be used for deployment of renewables, e.g., by DOE Office of Clean Energy Demonstrations.
  - Can be modified for research benefits.
- **Strengthen collaborations** with institutions that can use findings
  - Industry (Clean Fuels Alliance America and Antares Group)
  - Nonprofits, labor, utilities, DOE Energy Efficiency & Renewable Energy Office, DOE Energy Impact & Diversity Office.



Courtesy of Initiative for Energy Justice  
Used with permission, Melissa Sonntag

# 3 – Impact—Refine or alleviate stakeholder concerns

## Stakeholder concerns about bioenergy (from compilation)

- **Air pollution and health effects** from bioenergy facilities, especially in disadvantaged neighborhoods.
- **Trust** of some companies lacking because of air permit violations/pollution control failures.
- **Disproportionate siting** in minority & other disadvantaged communities.
- **Lack of transparency** in energy siting processes
- **Lack of fairness/inclusion** in county/city permitting processes
- **Household electricity rate increases** when a new biopower facility is built.
- **Competition for water** is a growing concern.

## This project

- Acknowledges concerns and inequities.
- Involves stakeholders in decisions
- Incorporates major concerns in decisions about what to measure (indicators)
- Leads to better understanding of problems and solutions through research.



Enviva Biomass plant in Greenwood, SC, Southwings@ViewsfromAbove

# Summary

- Justice40 and federal policies require integration of justice with energy transition.
- **This project**
  - co-developed bioenergy justice indicators with diverse stakeholders and proposes to apply them.
  - inventoried many BETO projects and recommended new research directions that study justice or remedy injustice.
  - reviewed literature on engagement and equity equity
- Community engagement is necessary but not sufficient for equity.
- Innovative elements of the project are
  - process of indicator selection
  - procedural justice indicators for the energy transition
  - bioenergy siting context as a focus for justice
  - good practices for community engagement in energy projects.



Credit Raul Mellado, istock

# Quad Chart Overview

## Timeline

- *Start: Nov. 1, 2021*
- *End: May 30, 2023*  
*(or Dec. 31, 2024 if extended)*

## Project Goal

Provide BETO with 1) tools needed to evaluate equity (justice) in US transition to renewable energy, including ways to measure equity and best practices for community engagement, and 2) portfolio analysis of BETO projects to identify and describe equity tasks and research gaps.

## End of Project Milestone

Using a community-centered approach to stakeholder engagement, submit a paper that provides:

- methods and guidelines for bottom-up justice and equity approaches to community engagement in development of bioenergy and other energy transition infrastructure
- examples that reveal how methods and guidelines must be adapted to local context and how we can learn from lived experiences of community members
- lessons learned and best practices in community engagement that can inform transition policies in bioenergy and beyond.

	FY22 Costed	Total Award
<b>DOE Funding</b>	186K spent (+ 99 NREL)	550K + 160K NREL
<b>Project Cost Share *</b>	NA	NA

Funding Mechanism: *Lab Call FY2022 Area of Interest 6: Crosscuts*

## Project Partners

- National Renewable Energy Laboratory
- Stakeholder Advisory Committee

TRL at Project Start: 2  
TRL at Project End: 3





# Additional Slides

# Responses to Previous Reviewers' Comments

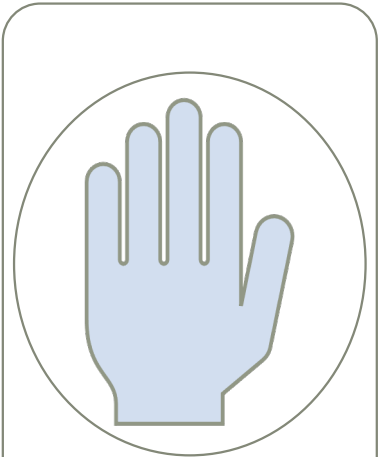
- No previous peer reviews
- The go/no-go milestone was a completed mid-project assessment of new directions, emphases, and needs for BETO related to equity, based on an inventory of at least 10 projects. Project passed this milestone.

# Publications, Patents, Presentations, Awards, and Commercialization

- In preparation. Energy justice indicators for the transition to renewables. Siting bioenergy facilities.
- **In preparation. Exploring community engagement and equity in energy projects – A Literature Review.**
  - Accepted for presentation at the XX ISA World Congress of Sociology
- In review. Setting targets to improve resource management (paper was begun under a project that ended; now includes justice and other socioeconomic targets)
- Working document. Inventory and portfolio assessment of example BETO-funded projects with equity-related tasks (internal to DOE)

# Appendix 1—Approach—Guide for Productive Meetings

Slide used in meetings with stakeholder advisory committee

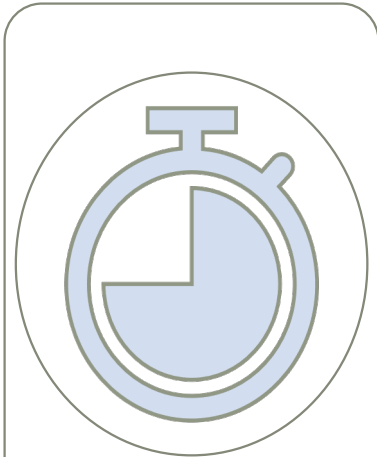


**SPEAK UP & ASK QUESTIONS PLEASE!**

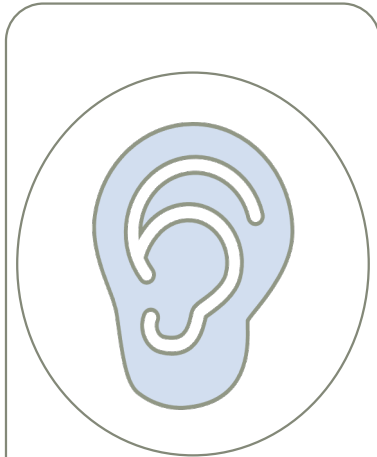
*Raise your hand or put comments & questions in the chat.*



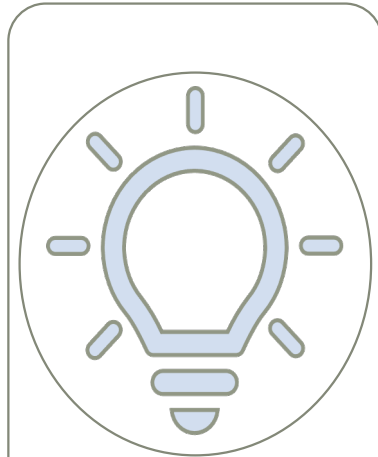
Help to make sure that everyone has *equal time* to contribute



Keep input *concise* and *focused* so that others have time to participate



*Actively listen* to understand others' perspectives. If a term or concept is not clear, ask for clarification.



*Offer ideas* to address others' questions and concerns



# Appendix 1 – Approach—Example criteria\* for selecting indicators

- Bioenergy relevance and applicability to multiple bioenergy pathways
- Applicability to economic, social or environmental objectives
- Representation of distributive, procedural, or restorative/recognition justice
- Practicality (straightforward and inexpensive to measure or model)
- Predictability in response
- Early warning (anticipate changes so preventive management is possible)
- Independence of scale (applicable or adaptable to local, regional, national scales)
- Responsiveness to management and/or policy incentives
- Clearly defined measurement units and desired direction of trend
- Small collective set without redundancy

\*Advisory group used these criteria implicitly, but group did not want to spend time discussing or modifying criteria for indicator selection. They wanted to spend the available time on selecting indicators.

# Appendix 1—Approach—Full questions asked of PIs of 27 example projects with justice tasks

- Does the project have an environmental or energy justice task? If so, what is that task? (This can be a formal task description from your AOP or just a few sentences.)
- Does the project measure or model environmental, economic, or social well-being indicators in a spatially explicit way that can be linked to locations of disadvantaged populations?
- Does the project consider alternative future land management regimes or policies that would likely impact disadvantaged communities?
- Are you measuring or modeling a baseline or reference scenario that would likely have disparate effects on disadvantaged and non-disadvantaged populations?
- Does the project involve stakeholder or community engagement in the research or outreach to communicate results? Or does it involve minority institutions or disadvantaged populations as partners?
- Are you working on a case study that focuses on a disadvantaged or underserved region?
- Do you have plans for future justice-related tasks that you would like to mention here?

# Appendix 2—Progress and Outcomes—More Info on Stakeholder Advisory Committee

- Bill Belden—Sr. Agricultural Specialist for Antares Group, Iowa farmer, switchgrass biomass pilot program
- Will Bryan—Director of Research at Southeast Energy Efficiency Alliance, focus on equitable energy policies and natural resource policies
- Dave Effross—Policy Advisor on AFL-CIO side of Labor Energy Partnership with Energy Futures Initiative.
- Berniece Herbert—Chair of Dept. Urban and Regional Planning at Jackson State University, urban health indicators, sustainable economic development and equity
- Renee Hoyos—Director of Office of Environmental Justice at Virginia Dept. of Environmental Quality
- Cassandra Johnson Gaither—Research Social Scientist with Southern Research Station, USDA Forest Service, human perceptions, nature and environment
- Ariel Kagan—Resource economist and director of agriculture strategy at Environmental Initiative, works with historically underrepresented farmers
- Stacie Peterson—Energy Program Director for National Center for Appropriate Technology, accessibility to renewable energy
- Tequila Smith—Vice President of Sustainability for Georgia Power, renewable energy, community support
- Floyd Vergara—Director of State Governmental Affairs for Clean Fuels Alliance America (formerly National Biodiesel Board), former California Air Resources Board

## Appendix 2—Progress and Outcomes—Procedural Justice Indicators, Draft

Category	Objective	Example indicator
Transparent reporting	Keep stakeholders informed of energy/infrastructure development plans, indicator values, and any problems as they arise	Percentage of indicators for which timely and relevant performance data are reported to public regularly
Participation	Enable participation of all through stakeholder process	Percentage of key organizations and communities providing input
Responsibility	Enable stakeholder/community leadership	Percentage of stakeholders/communities holding leadership roles in councils or committees
Trust	Engender trust	Percentage of participants who believe the process engenders trust
Influence	Determine effectiveness of stakeholder participation	Percentage of decisions on which stakeholders believe they had real input
Informed consent	Provide information to stakeholders on how their input will be used during the process and externally	Record of informed consent (yes/no)
Information access	Provide equitable access to relevant and relatable information	Categorical scale or percentage of report pages at 4 <sup>th</sup> grade level and translated to languages used by stakeholders
Property	Respect property rights during planning and development and use eminent domain judiciously and equitably. Only take land under eminent domain for public benefit and provide just compensation.	Percentage of participants who feel that the procedure for eminent domain is equitable and respects property rights
Dispute process	Establish process to resolve disputes and inconsistencies in project development and to permit course corrections	Categorical indicator (Clear published process, unpublished process, no process)
Outcome	Provide satisfactory process	Percentage of participants who accept project outcomes



## Appendix 2—Progress and Outcomes—Distributive Justice Indicators, Draft

Category	Objective	Example indicator
Social well-being—health and safety	Meet safe workplace standards, equitable safety and occupational health onsite, equitable health onsite	Work days lost due to injury or health hazards, incidence of disease (e.g., asthma) per capita
	Maintain or improve public health outcomes offsite; equitable health offsite	Workdays lost to health, incidence of disease (e.g., asthma) per capita
	Avoid major industrial catastrophes, equitable disaster probabilities	Risk of catastrophe
	Maintain or increase community resilience to disasters; equitable resilience	Redundancy in power source or feedstock (yes/no); redundancy in transportation fuel or battery system (yes/no); average time for community households to recover from power outage
Social well-being—resource access and affordability	Maintain or increase affordability of housing; equitable housing affordability	Median household income, per capita income
	Meet food security targets, equitable food security	Food cost burden (spending on food as a percentage of income)
Social well-being—employment	Move toward energy security for all, including ability to pay utility and transportation costs; equitable energy security	Energy burden or energy cost burden (spending on energy as a percentage of income)
	Maintain or increase employment; equitable employment	Per capita employment, employment growth rate
Social well-being—labor rights	Ensure wage equality (i.e., wages and benefits have fair pay scale across groups with similar experience, regardless of gender, race)	Prevailing wage, healthcare benefits, and retirement benefits, Categorical (yes/no)
	Ensure that management does not get involved in whether or not labor organizes into unions	Union neutrality, Categorical (yes/no)

## Appendix 2—Progress and Outcomes—Distributive Justice Indicators, Draft

Category	Objective	Example indicator
Social well being—education and training	Improve knowledge, equitable education	Availability of local training programs ((Y/N)and percent of available training accessed for bioenergy supply chain
Social well-being—mixed effects	Maintain or reduce stressors from traffic; equitable convenience/inconvenience	Noise level, annual injuries from accidents, driving time to employment, road damage metric or road maintenance frequency, or aggregate indicator of traffic congestion
Social well-being—aesthetics	Maintain or improve aesthetics; equitable aesthetics	Categorical viewshed rating; noise level; odor rating
Profitability	Maintain or increase proportion of land owned by local people; equitable ownership	Percent of land in pertinent counties owned by county residents
	Ensure affordability of prime agricultural land; equitable land value and affordability	Cost per acre
	Promote diversity in farm revenue with multiple market access opportunities (food/fuel/fiber); equitable market access	Return on investment
	Promote equity in incentive payments	Equitable proceeds from government grants and programs, Categorical (yes/no)
Environmental—water quality	Keep profits in community; equitable access to profits	Percent of profit that is returned to community
	Meet specified health criteria; equitable health; equitable recreation benefits; equitable aesthetics	Concentration of limiting nutrient (nitrate or total P) in streams
Environmental—water quantity	Meet drinking water and recreational needs; equitable water quality	Suspended sediment concentration in streams
	Meet drinking water, cooking, and washing needs; equitable water availability	Freshwater availability per person per year