



# Monthly Bioeconomy Webinar

September 2024

# Agenda

September 10, 2024

**01.**

## Welcome

Housekeeping Items  
LEC Partners Introduction

**02.**

## Guest Speaker and Q&A

Santiago Urquiza,  
Director | Blue Arrow SAF

**03.**

## Expert Recognition

Promotion & New Experts  
LEC All★Star

**04.**

## Close

Parting Reminders  
Dismiss

# Housekeeping



**Please be patient as we are using a new Webinar format.**

Thanks for your understanding as we get any technology opportunities resolved.



**Please mute your mic when not speaking.**

This helps us avoid background noise and minimize potential distractions.



**We will have Q&A after our speaker concludes.**

Please put your questions in the Q&A tab and we'll address them during this time.



# Guiding Businesses to Align Sustainability and Success

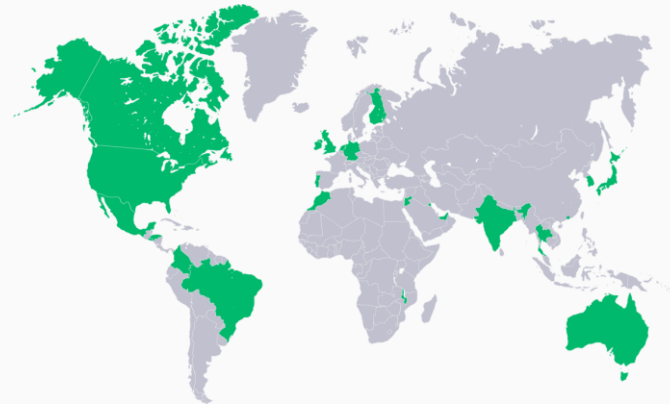
## Services

Funding Identification & Due Diligence  
Engineering & Project Oversight  
Project Development & Operations  
Regulatory & Specialty Services  
Expert Witness Services

## Areas of Expertise

Biobased Materials & Chemicals  
Bioenergy & Biofuels  
Biotechnologies  
Biopharmaceuticals  
Feedstocks

## Project Locations



Our experts have experience managing bioeconomy projects across geographic and cultural boundaries.

[Lee-Enterprises.com](http://Lee-Enterprises.com) • +1 (617) 444-8750 • [Info@Lee-Enterprises.com](mailto:Info@Lee-Enterprises.com)

**150+**

Experts

**30+**

Average Years of Experience

**50%**

C-Suite Executives

**97%**

PhD, MBA & Advanced Degrees

**\$3B**

Projects Evaluated



## Santiago Urquiza

Director  
Blue Arrow SAF

Location:  
Mexico City,  
Mexico



# Guest Speaker: Santiago Urquiza



Director  
Blue Arrow SAF  
2018 - Present



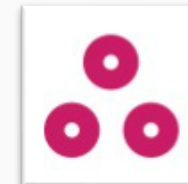
Project Manager  
SEIIA MX  
2017 – 2018



Engineer  
thyssenkrupp  
2008 – 2010



BA  
Mechatronics Engineering  
Tecnológico de Monterrey



Director  
BTS  
2012 – 2017



MBA  
Strategy and Finance  
IE Business School



Energy Cycles  
Ecole des Mines  
de Nantes

# BLUE ARROW COMPANY AND BUSINESS MODEL

# BLUE ARROW OVERVIEW

## Overview

- Blue Arrow, founded in 2017, is developing SAF projects around the world with patented municipal solid waste-to-low carbon fuel process under license from Fulcrum Bioenergy, Inc.
- Blue Arrow currently has several SAF projects in execution or advanced development including in Mexico (5), Spain (4) and LatAm (9).
- Plants convert zero-cost MSW feedstock into over high value, low carbon value SAF, resulting in very high margins.
- Blue Arrow has worldwide (ex-US) rights to develop, own and operate projects with Fulcrum's technology and IP, with exclusive rights in a growing list of markets such as Mexico, Spain, Brazil, Santiago, Medellin, Montevideo and others.
- Blue Arrow's license provides Fulcrum's IP, tech and know-how.
- Blue Arrow benefits fully from the extensive time and capital that Fulcrum has spent on its first commercial facility, the Sierra Biorefinery in Reno, NV.

## Benefits of the Blue Arrow Process

### FOR THE ENVIRONMENT

- ✓ Processes 80%+ of all MSW
- ✓ Reduces GHG
- ✓ Syncrude is a low carbon and no sulfur alternative to petroleum fuels
- ✓ Lowest carbon intensity score in the sector

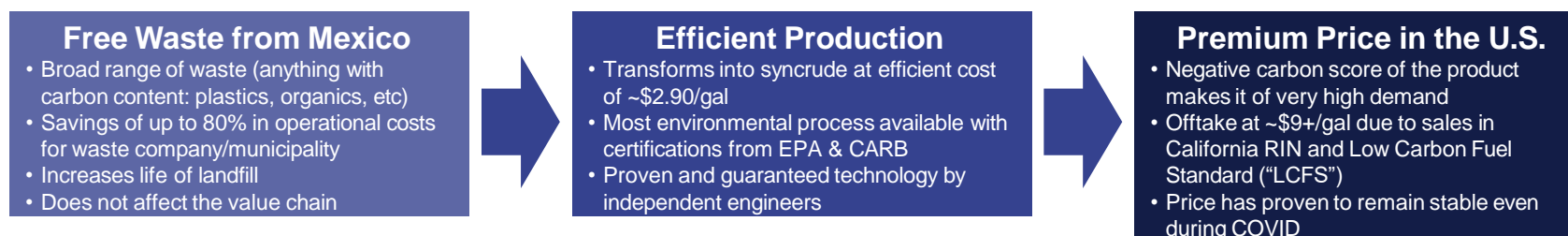
### FOR MSW CONCESSIONARIES

- ✓ Reduces their operating costs by 80%
- ✓ Increases their final disposition site's lifetime
- ✓ Reduces their costs for environmental control

### FOR LOCAL GOVERNMENTS

- ✓ Treats MSW in a cleaner way than alternatives
- ✓ Helps governments achieve climate goals
- ✓ Cheapest option & best results
- ✓ No cost, no investment and no offtake

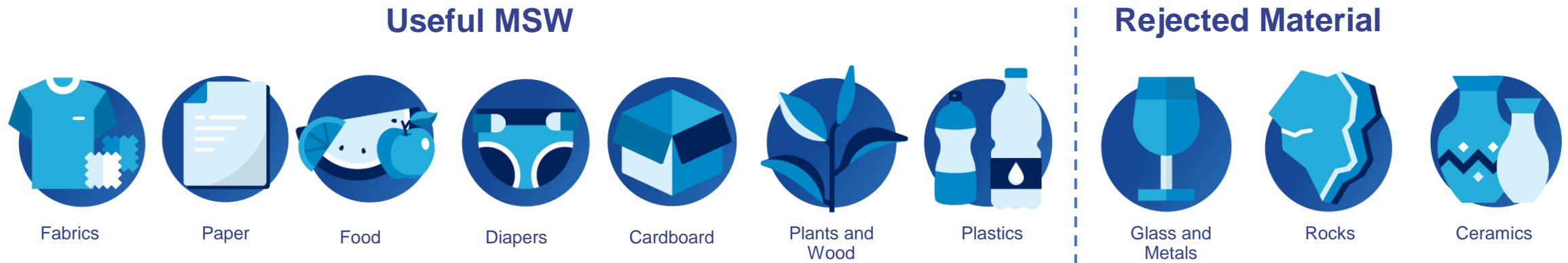
## Business Model



High margins enable readily financeable projects that ensure high profitability for Blue Arrow

# HIGHLY PROFITABLE BUSINESS MODEL – FREE WASTE

- The process uses any carbon-based material found in MSW, and as such, offers the **broadest possible spectrum of useful waste** in any geography or time of year
- The MSW used, comes at **ZERO COST through a 20-year long-term contract** with either local governments or private waste companies

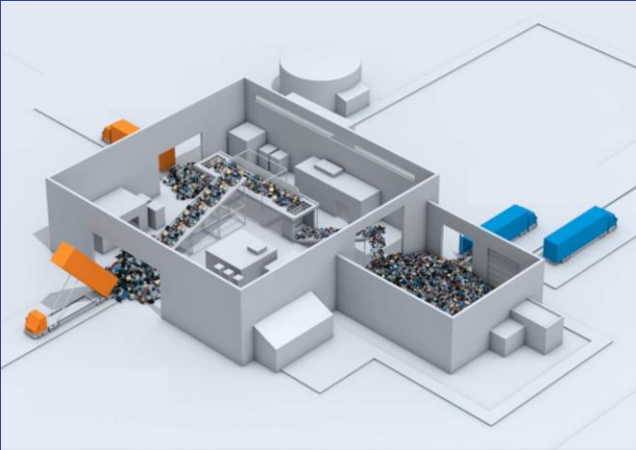


- The high margins of the process allow for the projects not to charge any tipping fee to the MSW supplier making this the only **FREE** treatment alternative to local governments or waste companies



# SYNCRUDE PRODUCTION PROCESS OVERVIEW

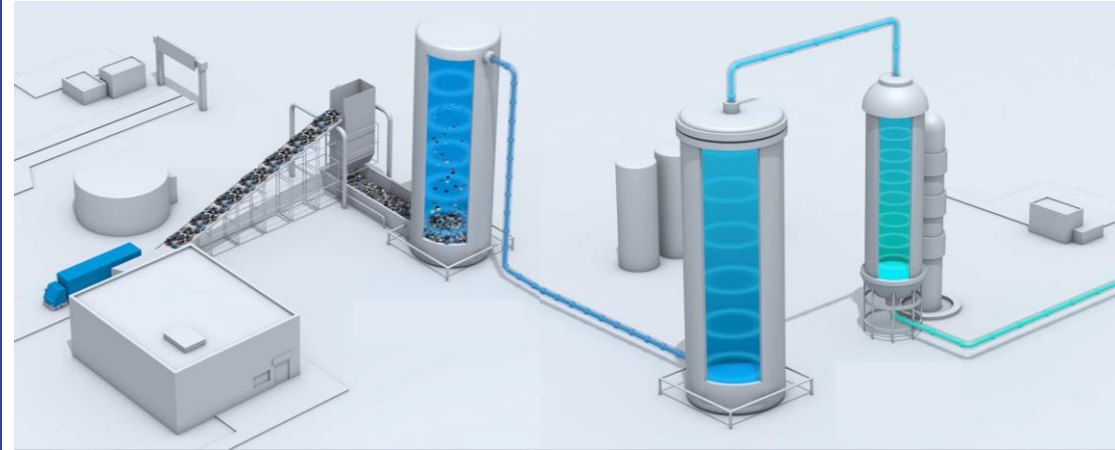
Blue Arrow Provides Value-Added Services Across the Environmental Products Ecosystem



## Step 1: Feedstock Processing

*Feedstock Processing Facility Prepares MSW for Fuels Process*

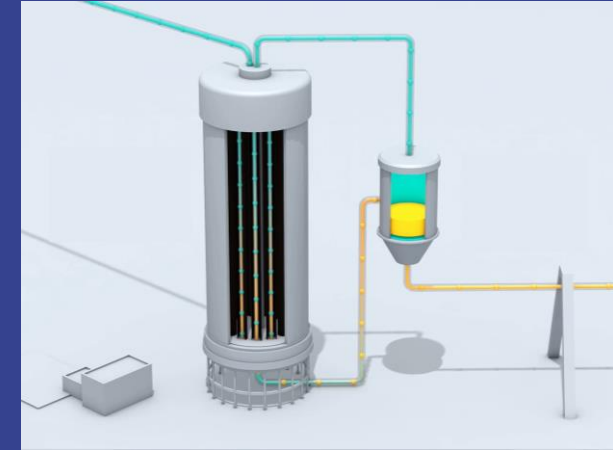
- MSW suppliers deliver fixed-cost feedstock
- Facility sorts and sizes prepared MSW feedstock
- Ensures prepared MSW feedstock meets gasification system requirements
- Metals, plastic and other high value recyclables recovered from the MSW feedstock
- Fulcrum has fully constructed and has been operating its feedstock processing facility in Nevada for approximately three years
- **Operating, Proven, Commercial and Guaranteed System**



## Step 2: Gasification

*Steam Reforming Gasification System Converts MSW to Synthesis Gas*

- Steam-Reforming gasifier heats MSW feedstock creating a syngas – primarily  $H_2$  and CO
- Heat recovery system cools syngas providing energy to plant
- Syngas is cleaned and compressed in preparation for the Fischer-Tropsch (“FT”) process
- Process demonstrated commercially starting in 2003
  - Same scale as Fulcrum’s commercial gasifier
- Gasification / syngas production at Sierra began in May 2022



## Step 3: Gas-to-Liquids

*Fischer-Tropsch Process Converts Synthesis Gas to Syncrude, Jet Fuel and Diesel*

- Syngas is processed through a FT reactor and forms FT liquids
- FT liquids are upgraded to form Jet Fuel, Diesel or other transportation fuel
- **Proven, Commercial Process With 9 Large-Scale Commercial Plants in Operation Worldwide**
- Liquid fuel / syncrude production at Sierra began December 2022

# PROVEN, PROPRIETARY TECHNOLOGY

## Commentary

### Proven Technology

- Integrated gasification and Fischer-Tropsch processes have been demonstrated and proven at scale by Fulcrum
- 3 patents: integrated process, product (the syncrude molecule) and MSW processing facility
- Each step of 3-part process has been operating in industrial use for decades and are commercially available

### Guaranteed Results

- EPC Contractor provides production guarantee
- Insurance Wrap provides financial guarantee
- Each of 3-part process (MSW processing, gasifier and Fischer- Tropsch) guaranteed and backed by reputable vendors

### Financeable Projects

- Bankable feedstock and offtake agreements
- More viable solution compared to other technologies that are more expensive, smaller scale, require very specific feedstock and offer lower environmental benefits
- Successful project financing proven by Fulcrum (bonds underwritten by Morgan Stanley and JP Morgan)

## Lessons Learned




- Successful integration of the many dozens of systems required to start up and operate the Sierra facility has required Fulcrum to make a number of changes to equipment, configurations, software and procedures.
  - The substantial amounts of time, capital and creativity spent in this effort have resulted in the creation of intellectual property exclusive to Fulcrum and included in Blue Arrow’s license
- The value of Blue Arrow’s license has been massively enhanced between the end of construction and the achievement of first fuel at Sierra
- As Fulcrum’s focus at Sierra shifts from technical to mechanical optimization, that license value will only continue to increase

## Fulcrum’s Sierra Facility






- Fulcrum’s first full-scale commercial plant near Reno, NV (“Sierra”) is operational
  - Gasification / syngas production began May 2022
  - Liquid fuel / syncrude production began December 2022
  - Sierra processes 400,000 tons of MSW annually and will produce approximately 10mm gallons of fuel
- Blue Arrow has the full benefit of Sierra as a reference facility for the technology and process
- Blue Arrow will also have the capability to test waste from Mexico at Sierra

## Sierra Technical Partners

| Company   | Role  |
|---|---|
| <br>BLACK & VEATCH | Owner’s Engineers                                     |
|                    | Independent Engineer for the lenders                  |
|                    | Refining Syncrude; purchasing renewable fuels credits |

# LICENSE AND SERVICES AGREEMENT WITH FULCRUM

*The license provides Blue Arrow with critical infrastructure that Fulcrum spent hundreds of millions of dollars to develop*

| Commentary   |                       |   |
|--|-----------------------|---|
|   | <b>Technology</b>     | <ul style="list-style-type: none"><li>▪ Exclusive license to utilize Fulcrum’s proven, proprietary, patented technology</li><li>▪ Fulcrum Fuel™</li><li>▪ Fulcrum’s Sierra plant serves as reference facility for waste providers and project investors</li></ul>                           |
|   | <b>Relationships</b>  | <ul style="list-style-type: none"><li>▪ Leveraging existing relationships with engineers, equipment vendors, offtakers, insurance providers, financiers, etc</li><li>▪ All key constituents already identified and actively advancing Fulcrum and Blue Arrow facility development</li></ul> |
|  | <b>Certifications</b> | <ul style="list-style-type: none"><li>▪ Fuel has received numerous certifications supporting premium economics</li><li>▪ Existing CARB score and D3 RIN eligibility</li><li>▪ Environmental certifications for projects</li></ul>   |

# PROJECT PIPELINE – Tier 1, 2 & 3

TIER 1

| PROJECT                          |
|----------------------------------|
| Monterrey                        |
| Metropolitan Area of Guadalajara |
| Tijuana                          |
| Estado de México                 |
| Santiago de Chile                |
| Lima                             |
| Quito                            |
| Canarias                         |
| Mancomunidad del Este            |
| Montevideo                       |

TIER 2

| PROJECT                     |
|-----------------------------|
| Metropolitan Area of Bogota |
| Ayuntamiento de Madrid      |
| Ciudad de México            |
| Guayaquil                   |
| Asturias                    |

TIER 3

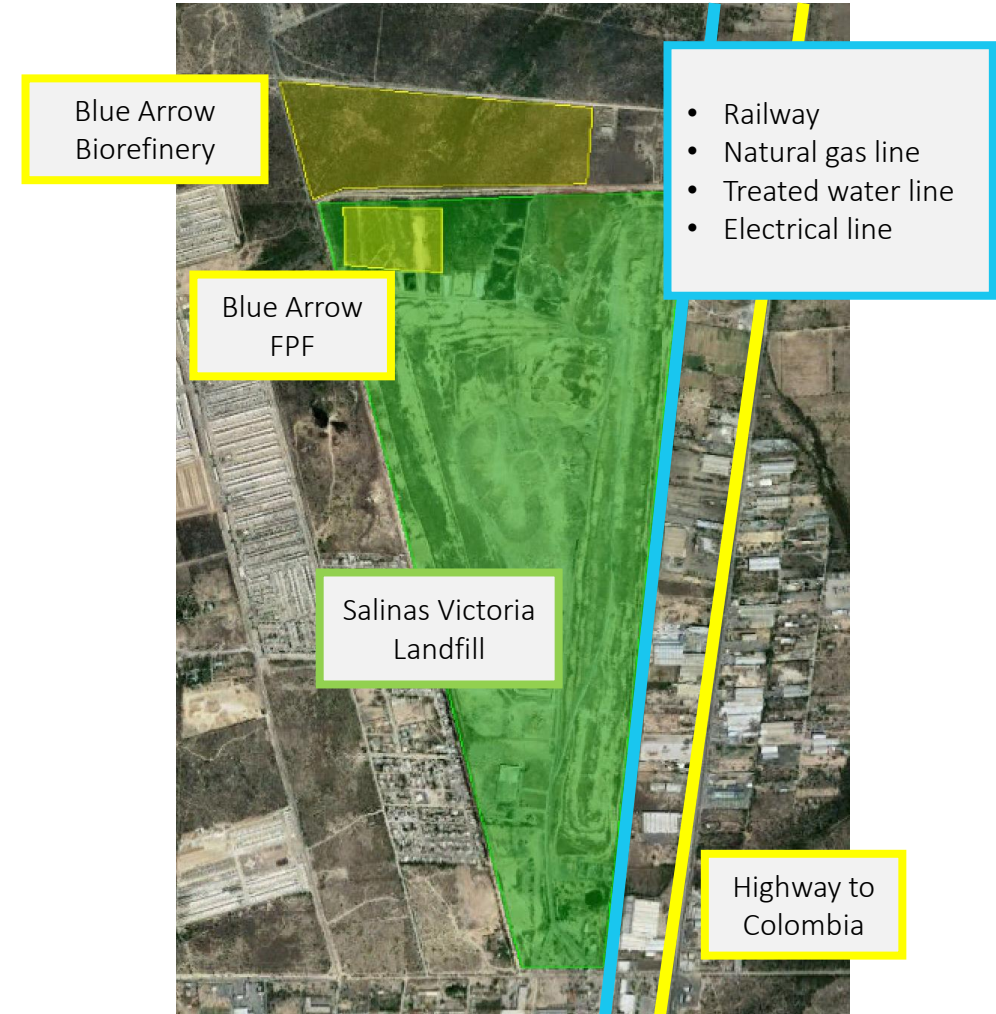
| PROJECT         |
|-----------------|
| Brazil          |
| Cd Buenos Aires |
| Medellín        |
| Panamá          |

## OTHER POTENTIAL PROJECTS BEING ACTIVELY ANALYZED



# Monterrey Project Site

- 100-acre site in Salinas Victoria, Monterrey adjacent to the Salinas Victoria Landfill
- Geological survey complete
- Generic industrial process EIA completed
- Initial prospecting studies done
- Land permitted for industrial processes
- The site has access to all the necessary services:
  - Natural Gas
  - Water (treated industrial)
  - High-voltage power grid
  - Access roads (including from Landfill)
  - Railway system



| Project Stage   | Description   | Responsible   |
|---|---|---|
| <b>Feasibility</b>  | <ul style="list-style-type: none"> <li>Initial conversations with Stakeholders</li> <li>Analysis on waste stream feasibility</li> <li>Analysis on value chain status quo</li> <li>Preliminary project structure</li> </ul>  | <b>Project Development Manager</b>  |
| <b>Handoff: Upon formal presentation to authorities and initial project viability</b> |   |   |
| <b>Government/Waste Company Interaction</b>   | <ul style="list-style-type: none"> <li>Preparation of formal proposal to authorities or waste company</li> <li>Relationship management with authorities or waste company</li> <li>Waste contract terms and conditions</li> <li>Formal process management</li> <li>Permitting</li> </ul> | <b>Waste Industry Opinion Leader</b>                                      |
| <b>Structure</b>  | <ul style="list-style-type: none"> <li>Project Structure</li> <li>Site selection</li> <li>Revenue management</li> <li>Utilities</li> <li>Logistics</li> </ul>   | <b>Project Dev Manager</b><br>Project Execution Mgr.<br>Financial Analyst |
| <b>Handoff: Upon signing of waste contract</b>  |   |   |
| <b>Execution</b>  | <ul style="list-style-type: none"> <li>Engineering FEL3</li> <li>Financing process</li> <li>Financial Close</li> <li>Final Contracting</li> <li>Detailed Engineering</li> <li>Construction</li> <li>Commissioning</li> </ul>  | <b>Project Execution Mgr.</b><br>Project Dev Manager<br>“Fulcrum Liaison” |

# BA TEAM AND NETWORK

## MEXICO

We have a working group with a very wide range of specialties covering all needs for the development process of the projects.

- Legal in-house Council
- Legal regulatory and contracting expertise
- Waste management senior analyst
- Sustainability Manager
- Project Management
- Communication and PR
- Project development senior analysts

## LOCAL DEVELOPERS

We have local developers with the reach and contacts to establish conversations for possible projects. They all have outstanding professional careers with all necessary know-how on Project development.

- Spain
- Uruguay
- Buenos Aires
- Ecuador
- Peru
- Brazil
- Paraguay

## LOCAL PARTNERS

On projects moving further along and with a confirmed feasibility we have local partners comprised of: local law firms, local construction companies, among others:

- Cuatrecasas Chile
- Cuatrecasas Colombia
- ASB Abogados (Colombia)
- Cassagne (Buenos Aires)
- SACEEM (Montevideo)
- Ferrere (Montevideo)
- Cuatrecasas Peru

## GLOBAL COLLABORATIONS

We are in conversations with key waste companies that could be our global partners or regional partners that have waste contracts in place and have expertise in waste sorting and feedstock preparation.

- PreZero
- PASA
- Urbaser

# Q & A



**Santiago Urquiza**

Director  
Blue Arrow SAF

Location:  
Mexico City,  
Mexico





# Expert Recognition

# Maya Benami

## Promoted to LEC Project Director

“Maya has made significant contributions to LEC throughout her time with us, consistently demonstrating a remarkable ability to exceed client expectations across numerous projects. Her deep expertise in Novel Foods, Microbiology, Bio-agriculture, and other Biotechnologies, combined with her exceptional organizational and leadership skills, make her an invaluable asset.

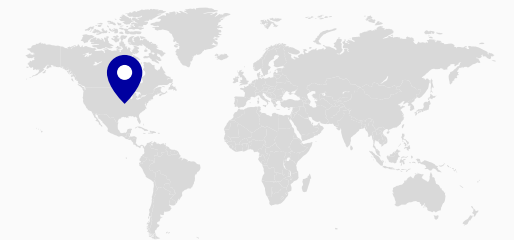
We are thrilled to have her take on this enhanced role.”

-JD Creedon



**Location:**

Tennessee,  
United States



# New Expert Welcome Yvon Pelletier

## Areas of Expertise

- Bioproducts
- Bioenergy
- Pulp & Paper Operations
- Pellet Manufacturing
- Risk Review



### Location:

Quebec,  
Canada



# New Expert Welcome John "JC" Olson

## Areas of Expertise

- Strategy Development
- Market Development
- Product Development
- Business Development
- Supply Chain Management
- Risk Management
- Operational Scale-up
- Operational Leadership
- Capital Investment
- Project Management



### Location:

Idaho,  
United States



# LEC All★Star Alert!

## Tim Hoy

“From the beginning of the DR Johnson project, Tim was extremely responsive and dedicated to getting the information to the client. His experience with biomass to power helped us establish expert credibility with the client and was instrumental in delivering a very well-received final presentation. Further, at one point in the proposal process, Tim was prepared to leave his vacation and drive 150 miles to the DRJ Site to inspect their facility.

Tim showed real dedication and expertise on this project and deserves to be recognized.”

-Pete Rocha



**Location:**

BC,  
Canada



Monthly  
Newsletter  
Sign-up



Helping Clients Navigate the  
Bioeconomy for Over 25 Years

**Have a great month!**

✉ [info@lee-enterprises.com](mailto:info@lee-enterprises.com)

🌐 [lee-enterprises.com](http://lee-enterprises.com)

🌐 [LEC Partners](#)

📞 +1 (617) 444-8750

📍 Headquarters:  
Cambridge, MA  
Bentonville, AR