



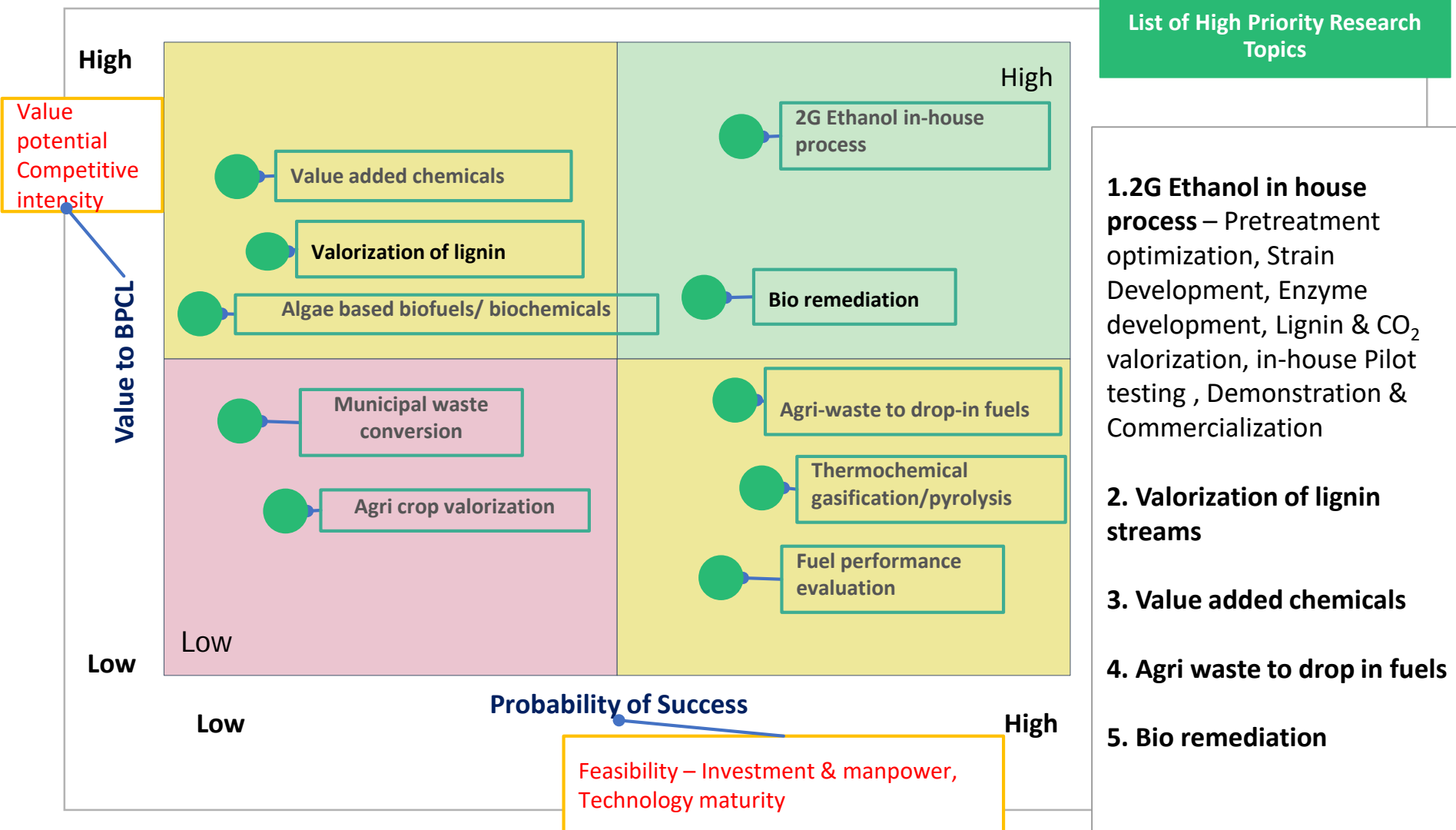
# BHARAT PETROLEUM CORPORATION LIMITED

## Corporate R&D Centre

**Sanjay Bhargava**  
Executive Director (R&D)

(Cellulosic Ethanol)

# Prioritization of R&D Areas



# Future Plans

## CELLULOSIC ETHANOL

### Pretreatment targets

- Separation of C<sub>5</sub> and C<sub>6</sub> streams
- Sugar recovery more than 90%
- Lignin Recovery

### Enzyme Development

- Cost reduction
- On-site production

### Engineering Yeast

- Thermo-tolerant to produce higher ethanol titer
- Utilization of both C5 & C6 sugars
- Tolerant to inhibitors- Hydroxy Methyl furfural, furfural
- Cost effective fermentation

### Valorization

- Value added chemicals such as lactic acid
- Lignin to carbon fiber
- CO<sub>2</sub> to drop-in fuels, methanol, DME