



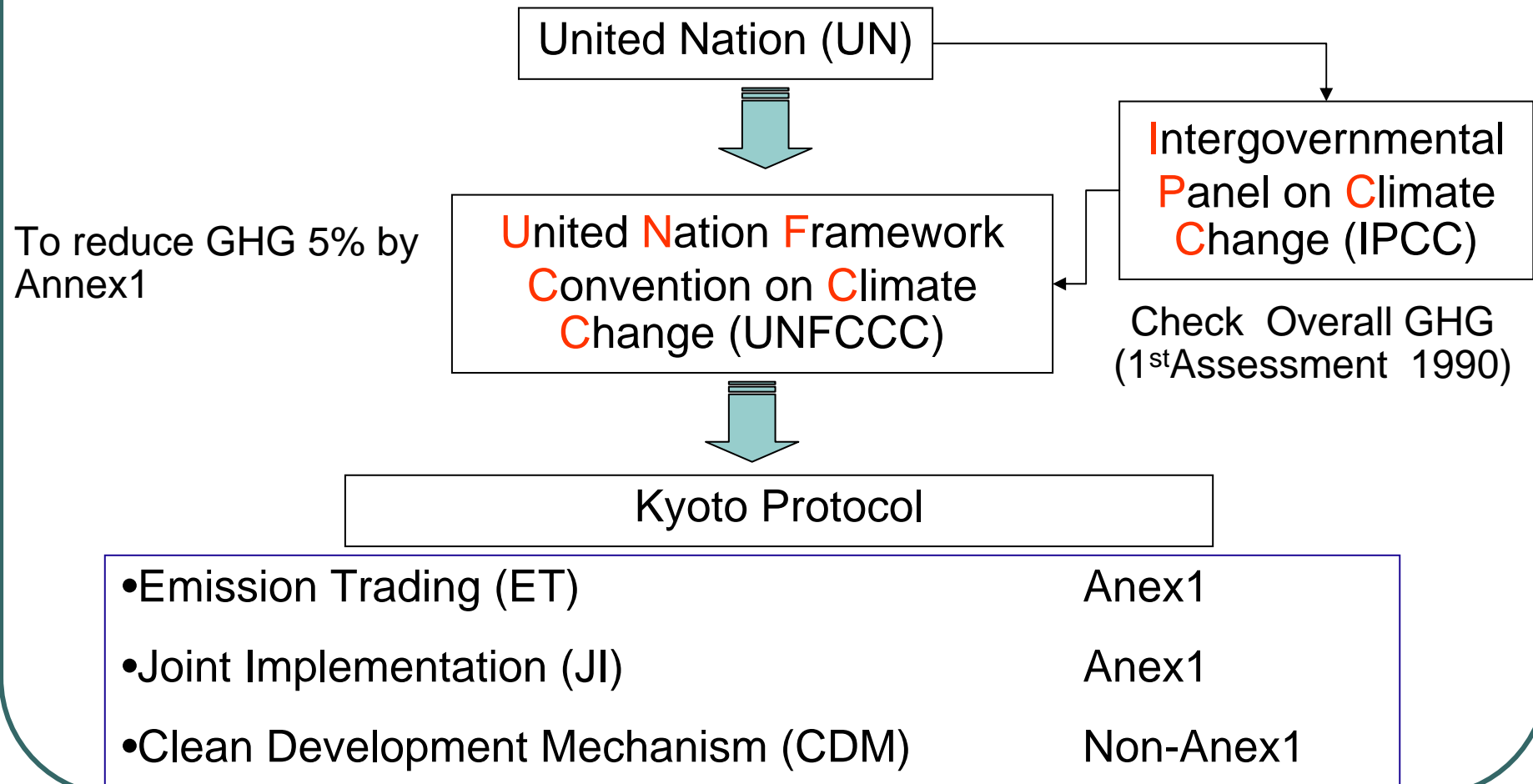
THAI CAPROLACTAM PCL

CDM Project

N₂O Abatement in Tail Gas

UBE UBE GROUP (THAILAND)

Background of CDM



Annex 1 List

| Europe | | | North America | Australia | Asia |
|---------------|---------------|----------------|---------------|-------------|-------|
| Austria | Liechtenstein | Portugal | Canada | Australia | Japan |
| Beralus | Lithuania | Romania | U.S.A. | New Zealand | |
| Belgium | Luxembourg | Russian | | | |
| Bulgaria | Monaco | Slovakia | | | |
| Croatia | Netherlands | Slovenia | | | |
| Chec Republic | Norway | Spain | | | |
| Denmark | Poland | Sweden | | | |
| Estonia | Hungary | Switzerland | | | |
| Finland | Iceland | Turkey | | | |
| France | Ireland | Ukraine | | | |
| Germany | Italy | United Kingdom | | | |
| Greece | Latvia | European Union | | | |

GHG Reduction Target

| | Reduction Target | Y1990 Emission | | Reduction Target | Y1990 Emission | | Reduction Target | Y1990 Emission |
|-------------|------------------|----------------|-----------|------------------|----------------|---------------|------------------|-----------------------------------|
| Portugal | 27.0% | 65 | Russia | 0.0% | 3,040 | Iceland | 10.0% | 3 |
| Greece | 25.0% | 107 | Ukraine | 0.0% | 919 | Australia | 8.0% | 424 |
| Spain | 15.0% | 289 | Croatia | -5.0% | - | Norway | 1.0% | 52 |
| Ireland | 13.0% | 54 | Poland | -6.0% | 565 | New Zealand | 0.0% | 73 |
| Sweden | 4.0% | 71 | Rumania | -8.0% | 265 | Canada | -6.0% | 607 |
| Finland | 0.0% | 77 | Czech | -8.0% | 192 | Japan | -6.0% | 1,237 |
| France | 0.0% | 559 | Bulgaria | -8.0% | 157 | US(withdraw) | -7.0% | 6,136 |
| Netherlands | -6.0% | 212 | Hungary | -6.0% | 102 | Switzerland | -8.0% | 53 |
| Italy | -6.5% | 521 | Slovakia | -8.0% | 73 | Liechtenstein | -8.0% | 0 |
| Belgium | -7.5% | 143 | Lithuania | -8.0% | 52 | Monaco | -8.0% | 0 |
| England | -12.5% | 746 | Estonia | -8.0% | 44 | EU 15 | -8.0% | 4,230 |
| Austria | -13.0% | 78 | Latvia | -8.0% | 31 | | | |
| Denmark | -21.0% | 70 | Slovenia | -8.0% | 19 | | | |
| Germany | -21.0% | 1,225 | Luxembou | -28.0% | 13 | | | |
| | | | | | | | | Global TTL (Mt CO ₂ e) |
| | | | | | | | | 18,274 |

3 Countermeasures To Reduce GHG by Kyoto Protocol

- Emission Trading (ET)
Annex 1 country trade the remain Quota of GHG to Other Annex 1 country
- Joint Implementation (JI)
Annex 1 Join together to reduce GHG in Annex 1 country
- Clean Development Mechanism (CDM)
Non-Annex 1 Reduce GHG and trade to Annex 1

Heart of CDM

- Kyoto Protocol Member
- Voluntary
- Sustainable
- Additionality
- Measurable

Ube Group CDM Project Objective & Target

- **Objective**

- To Support CSR Activity of UBE Group Thailand
- To contribute to Global Warming Reduction

- **Target**

- To Reduce GHG ~ 165,000 Ton Eq.CO2

Ube group

N2O Reduction Application

- Reduce N2O emits from Caprolactam Production Plant ~ 530 ton/year
- Catalytic Abatement applied at Tail Gas before Stack
- Methodology used AM0028 Version 4.1

Activities

Preliminary Stage

1 Self Audit

- Check Existing Condition of GHG
- Check Possible CDM Project
- Check Possible Methodology

- 
- Kyoto Protocol
 - Voluntary
 - Additionality
 - Sustainable

2 Feasibility Study

3 Buyer

Activities

Document Preparation

4 Methodology Selection

- Methodology selected should be easy to measured and verified

5 PDDs Preparation

- PDDs consistent to Methodology and Operation
- Stakeholder Meeting

5.1 Environment Impact Evaluation

- IEE Report or EIA Report (Thailand)

Activities Validation Stage

6.1 Validation by DOE

6.2 Buyer Country Approval

6.3 Approval by Thai DNA

- IEE Report or EIA Report
- PDDs
- Preliminary Assessment

- 
- Environment
 - Social
 - Economic
 - Sustainable

Activities Registration Stage

Request for Registration To CDM EB

- PDDs
- Validation report By DOE(1)
- Letter of Approval from Buyer Country
- Letter of Approval from Thai DNA

Designate Of Entity DOE(1)

DOE's function of Validation stage

- Completeness Check of PDD
- PDD conform with selected Methodology
- PDD conform with Site condition
- Prepare Validation report
- Request for registration
- Transparent, Conservative

Activities Implement Stage

Installation

- Conform with PDD

Verification

- Suitable Interval
- Data completion and consistent with PDDs
- Verification report by DOE (2)
- Request for Issuance of Cers by DOE (2)

Designate Of Entity DOE(2)

DOE's Function for Verification Stage

- Site condition as PDD
- Data Correction as PDD monitoring plan
- Completeness Check and Others
- Prepare Verification report
- Request for Issuance of Cers
- Transparent, Conservative

Key Success Factor

- **Speed**
- **Government Support**
- **Suitable Methodology**
- **Historical Data, Base line**
- **Quality Management Tool**
 - ISO9001, 14001, etc.

Risk of CDM Project

- **CERs Market Volatility**
- **Regulation Risk**
- **Credit Period**
- **Methodology Updated or Modified**

List of DOE: Designated Operational Entity

| | |
|---------------|---|
| E-0001 | Japan Quality Assurance Organization (JQA) |
| E-0002 | JACO CDM.,LTD (JACO) |
| E-0003 | Det Norske Veritas Certification AS (DNV Certification AS) |
| E-0005 | TÜV SÜD Industrie Service GmbH (TÜV-SÜD) |
| E-0006 | Tohatsu Evaluation and Certification Organization Co., Ltd. (TECO) |
| E-0007 | Japan Consulting Institute (JCI) |
| E-0009 | Bureau Veritas Certification Holding S.A. (BVC Holding S.A.) |
| <i>E-0010</i> | <i>SGS United Kingdom Ltd. (SGS)</i> |
| E-0011 | The Korea Energy Management Corporation (KEMCO) |
| E-0013 | TÜV Rheinland Japan Ltd. (TÜV Rheinland) |
| E-0014 | KPMG Sustainability B.V. (KPMG) |
| E-0018 | British Standards Institution (BSI) |
| E-0021 | Spanish Association for Standardisation and Certification (AENOR) |
| E-0022 | TÜV NORD CERT GmbH (RWTUV) |
| E-0023 | Lloyd's Register Quality Assurance Ltd (LRQA) |
| E-0024 | Colombian Institute for Technical Standards and Certification (ICONTEC) |
| E-0025 | Korean Foundation for Quality (KFQ) |
| E-0029 | PricewaterhouseCoopers - South Africa (PwC) |

Thai Registered CDM Project

| | Project | CO2 Eq. |
|----|---|---------|
| 1 | Jaroensompong Corporation Rachathewa Landfill Gas to Energy Project | 47,185 |
| 2 | Ratchaburi Farms Biogas Project at SPM Farm | 23,556 |
| 3 | Ratchaburi Farms Biogas Project at Nong Bua Farm | 15,958 |
| 4 | Korat Waste To Energy | 310,843 |
| 5 | Khon Kaen Sugar Power Plant | 61,449 |
| 6 | Phu Khieo Bio-Energy Cogeneration project (PKBC) | 102,493 |
| 7 | A.T. Biopower Rice Husk Power Project in Pichit, Thailand | 70,772 |
| 8 | Ratchaburi Farms Biogas Project at Veerachai Farm | 32,092 |
| 9 | Dan Chang Bio-Energy Cogeneration project (DCBC) | 93,129 |
| 10 | Surat Thani Biomass Power Generation Project in Thailand | 106,592 |
| | | |
| | Total CO2 Eq. (Ton) | 864,069 |

Sample of CERs Market



<http://www.eex.com>











<http://www.europeanclimateexchange.com>



<http://www.emit-markets.com>

Sample of CERS Pricing

Second Period European Carbon Futures

| Name | Best Bid | Best Ask | No. of Contr. | Last Price | Abs. Change | Last Time | Last Vol. | Settl. Price | Vol. | Vol. OTC Clearing | Open Interest | |
|--------------------|----------|----------|---------------|------------|-------------|-----------|-----------|--------------|---------|-------------------|---------------|---|
| <u>2008</u> | 23.75 | 24.05 | 125 | 23.75 | 0.06 | 12:17 | 30,000.00 | 23.69 | 125,000 | 10,000 | 5,125 |   |
| <u>2009</u> | 24.25 | 24.75 | 45 | 24.40 | 0.12 | 11:26 | 25,000.00 | 24.28 | 45,000 | 20,000 | 1,940 |   |
| <u>2010</u> | - | - | - | - | - | - | - | 24.87 | - | - | 965 |   |
| <u>2011</u> | - | - | - | - | - | - | - | 25.46 | - | - | - |   |
| <u>2012</u> | - | - | - | - | - | - | - | 26.09 | - | - | - |   |
| | | | | | | | | | Vol. | Vol. OTC Clearing | Open Interest | |
| Total | | | | | | | | 170,000 | 30,000 | 8,030 | | |
| | | | | | | | | | Vol. | Vol. OTC Clearing | Open Interest | |

CDM Stories



CDM: Overall

<http://unfccc.int/2860.php>



CDM: Buyer/Seller/Service

<http://www.cdmbazaar.net>



GHG: Detail <http://www.ipcc.ch>



THAI CAPROLACTAM PCL

Any Question Please Address To
Pichai@Ube.co.th

UBE UBE GROUP (THAILAND)

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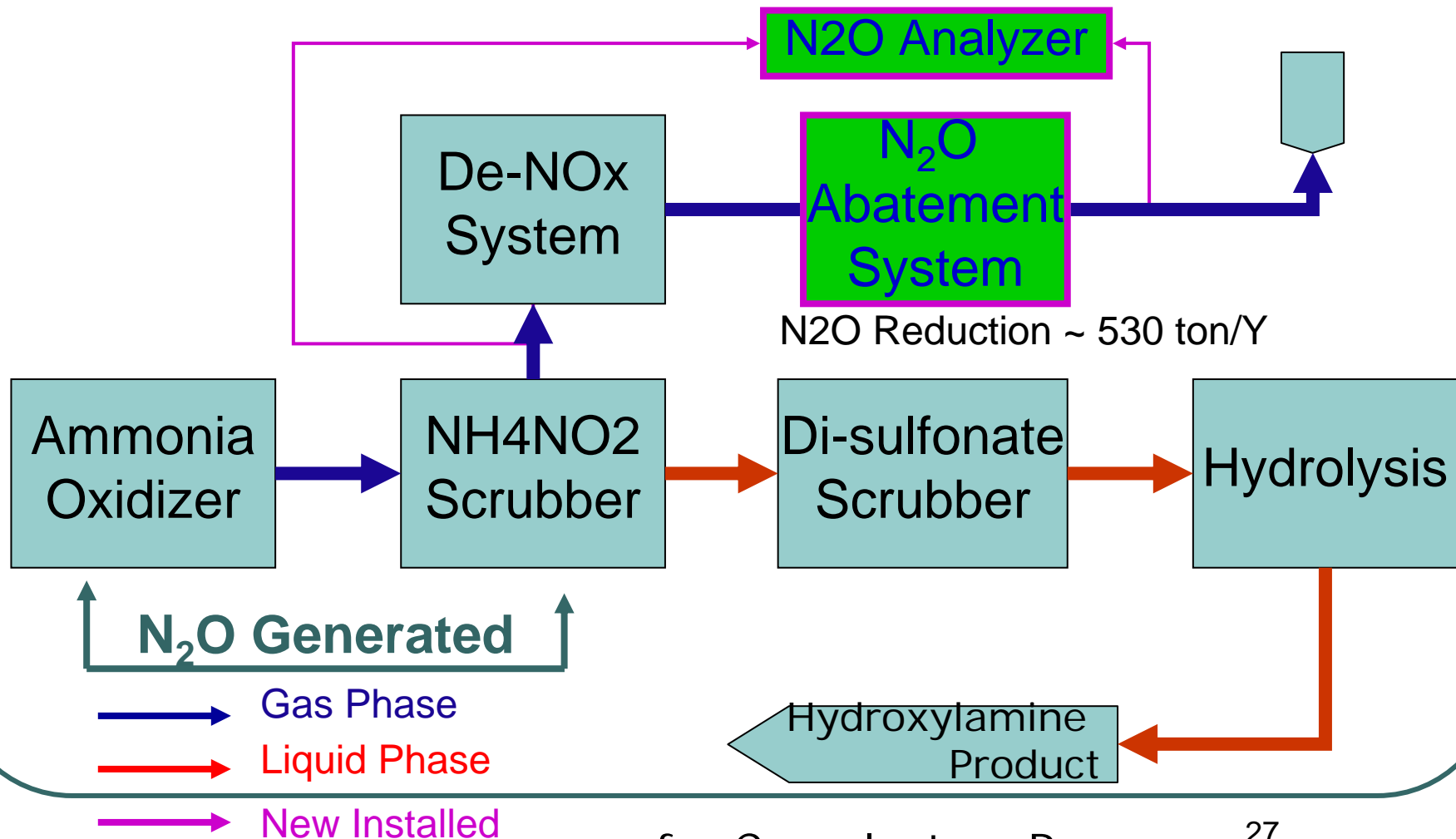
- CDM Clean Development Mechanism
- CDM EB CDM Executive Board
- CERs Certified Emission Reductions
- DNA Designated National Authority
- DOE Designated Operational Entity
- EIA Environment Impact Assessment
- ET Emission Trading
- GHG Global greenHouse Gas
- IEE Initial Environment impact Evaluation
- IPCC the Intergovernmental Panel on Climate Change
- JI Joint Implementation
- PDDs Project Design Documents
- UNFCCC United Nations Frameworks Convention on Climate Change

Activity Stakeholder Meeting



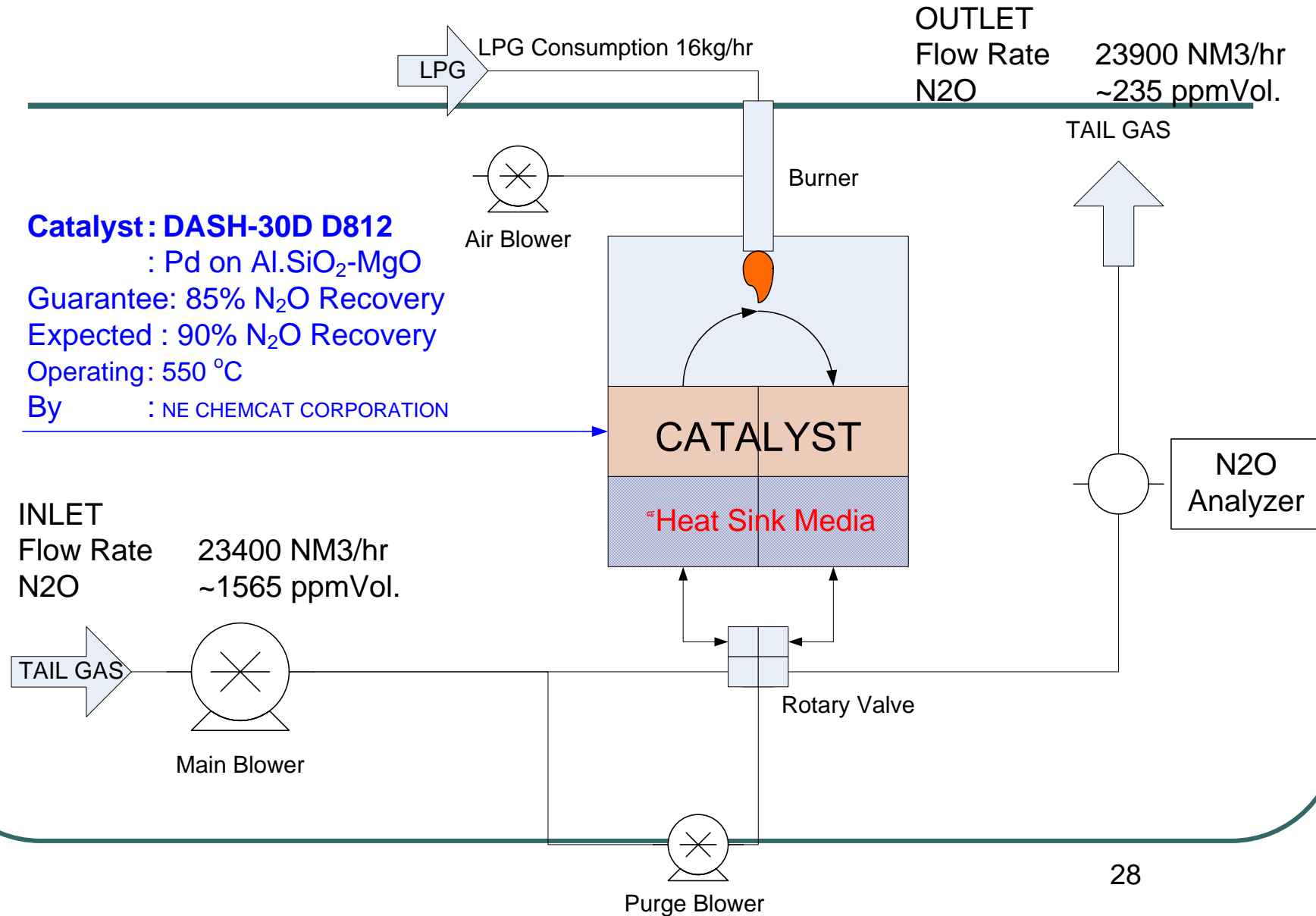
CDM Project Stakeholder Meeting On May 9, 2007

Installation Detail



for Caprolactam Process

N2O Abatement Detail



Reference Plant

