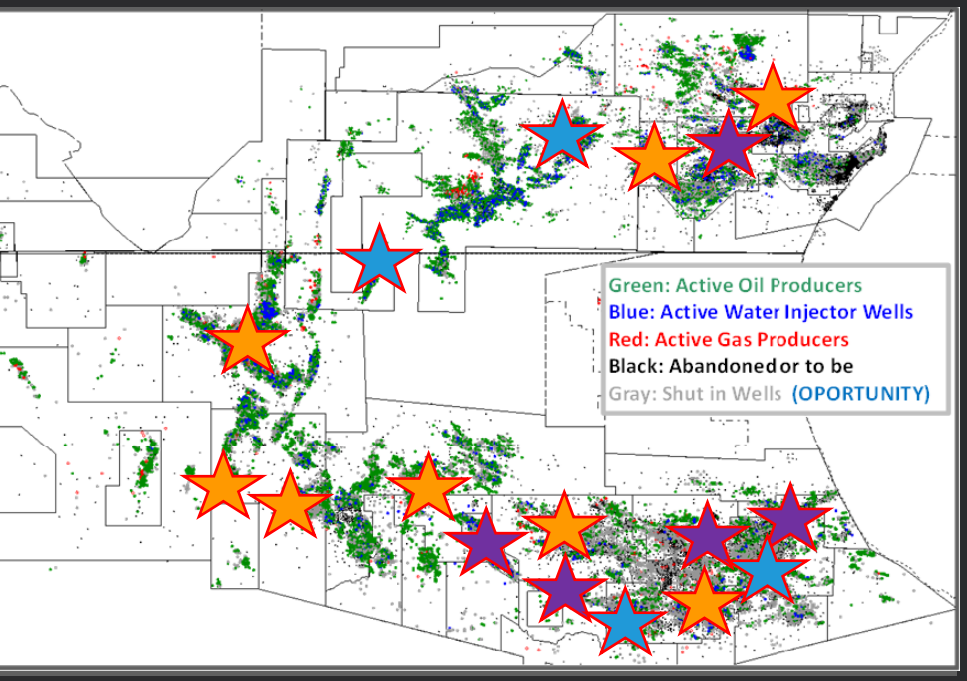
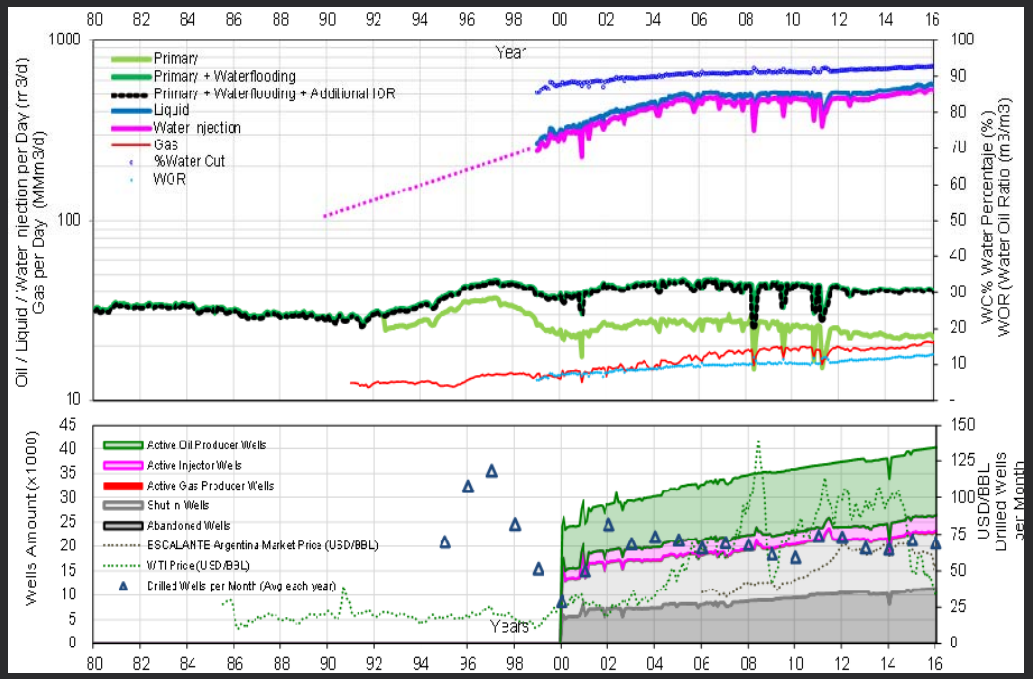
WATERFLOODING 2.0

WATERFLOODING 2.0

BASIN´s LOCATION & HISTORY





1944

Santa Cruz development (Canadon Seco)

1957- 75

Primary Development of Cerro Dragon, Huemul, Zorro, Cdon de La Escondida, Las

1970's

Incipient Waterflooding starts in Cdon Leon, Cerro Dragon, Pico Truncado and Ant.

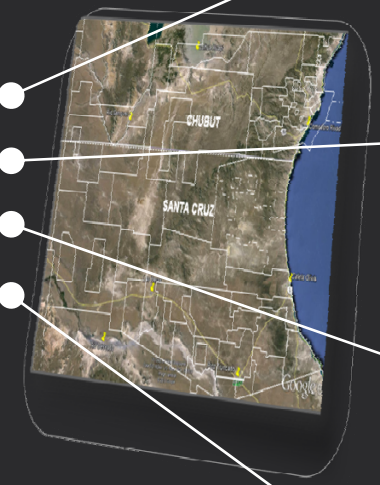
1980's

Waterflooding starts in El Cordon, Piedra Clavada, C. Seco, El Tordillo, Koluel Kaike y

1990's

Waterflooding starts in C. Minerales, El Huemul, Diadema, Los Perales, El Guadal, C.

BASIN MAIN CHARACTERISTICS



Concessions

ds in **two**

rovinces

GEOLOGY

Higly compartimentalized both straigraphically (complex fluvial environment) and structurally (faults)

FLUIDS

Various migratory pulses and bio degradation → large variability in key properties like viscosities, Rs.

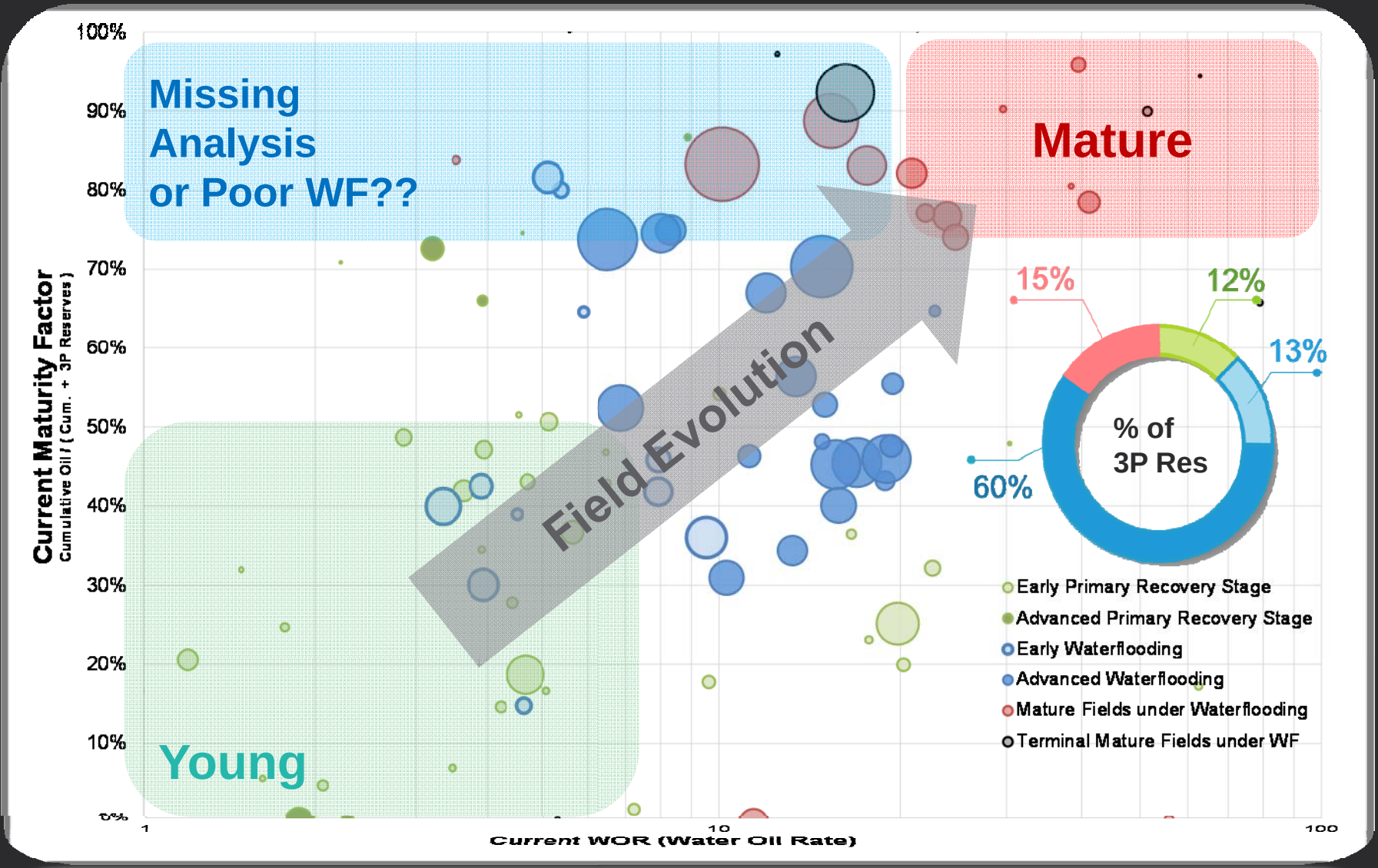
EXPLOITATION

5 to 30+ perforations per well, partially tested, many generation tools co existing, mechanical status, etc.

SURFACE

Corrosion, injection pressures, treatment capacity, water disposal, treatment, environmental issues, high

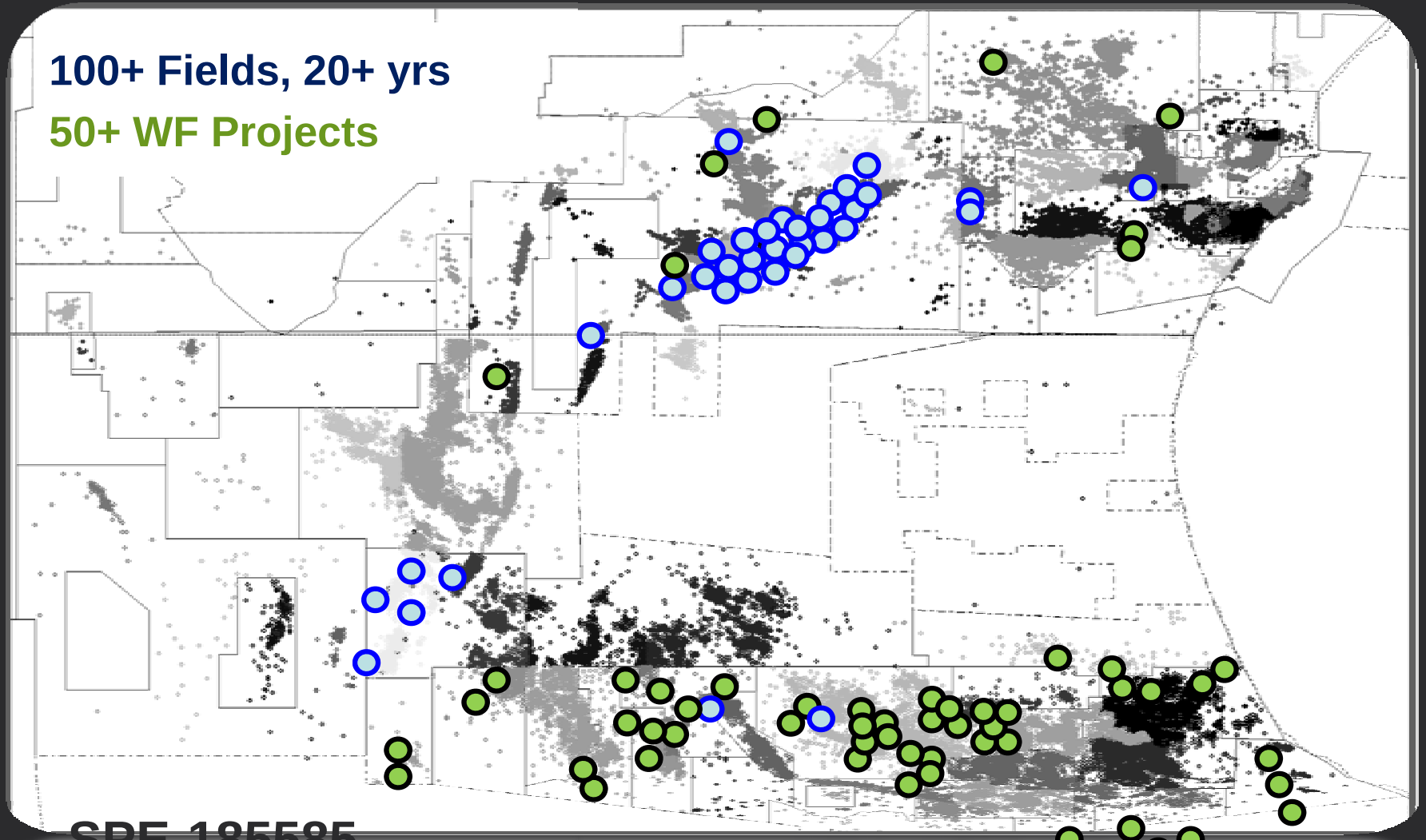
MATURITY ASSESSMENT



THE “VOICE” of EXPERIENCE

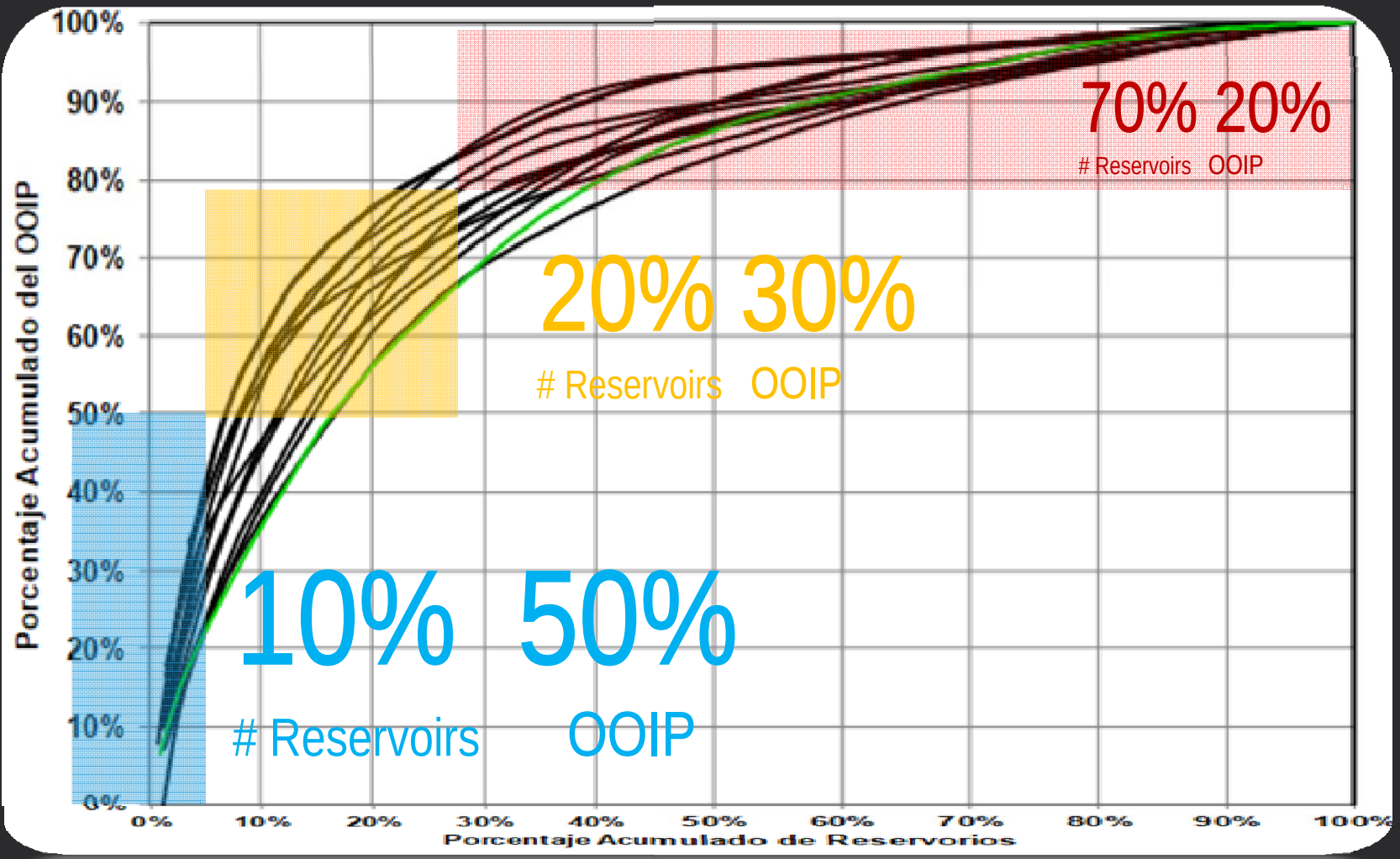
e than 15 yrs and 100 blocks (+6,000 wells) studied

e



THE “VOICE” of EXPERIENCE

OOIP follows a similar to PARETO distribution

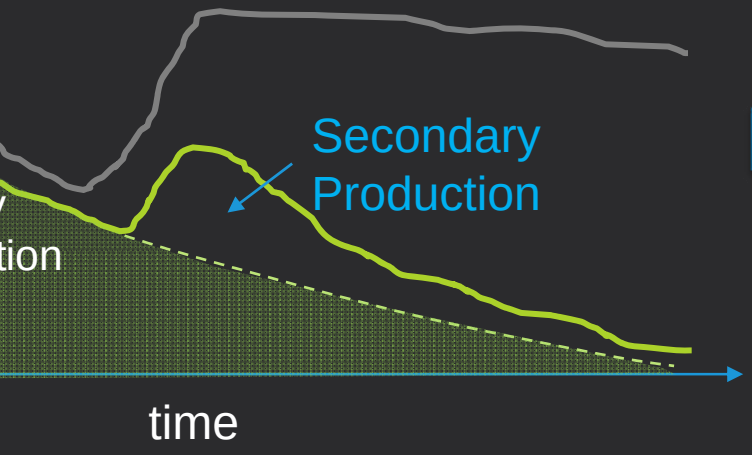


THE “VOICE” of EXPERIENCE

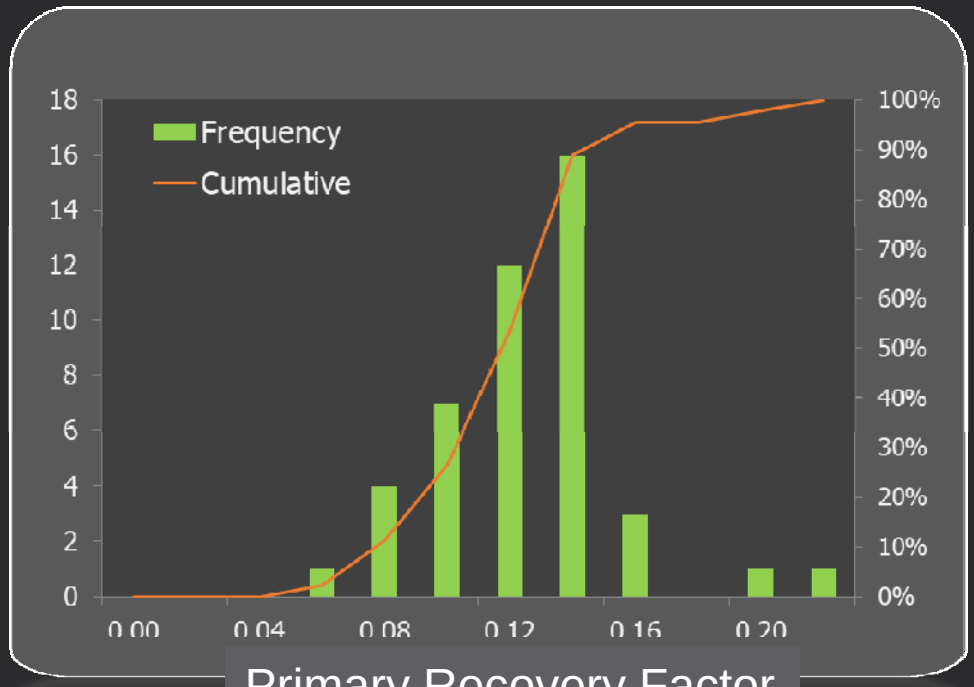
ormance of Historical Waterflooding Projects in GSJ

tor #1

y Recovery Factor



P_{50}= 12 %

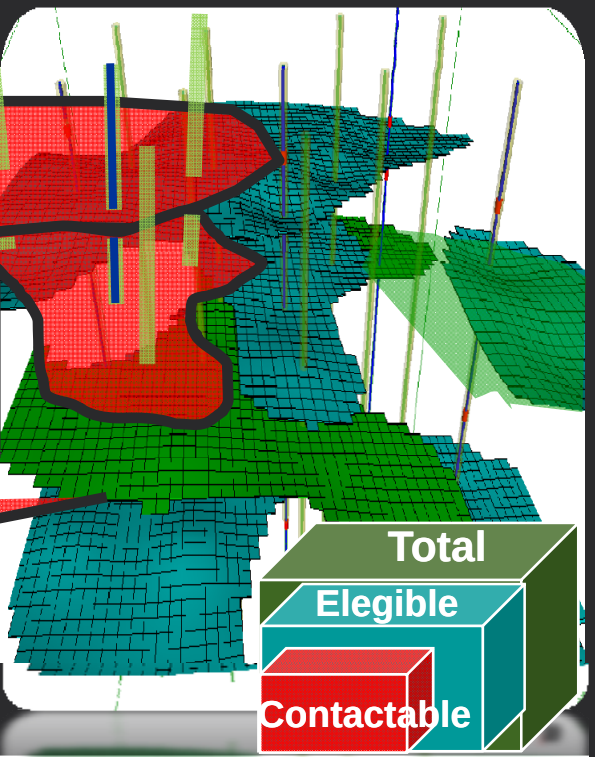


THE “VOICE” of EXPERIENCE

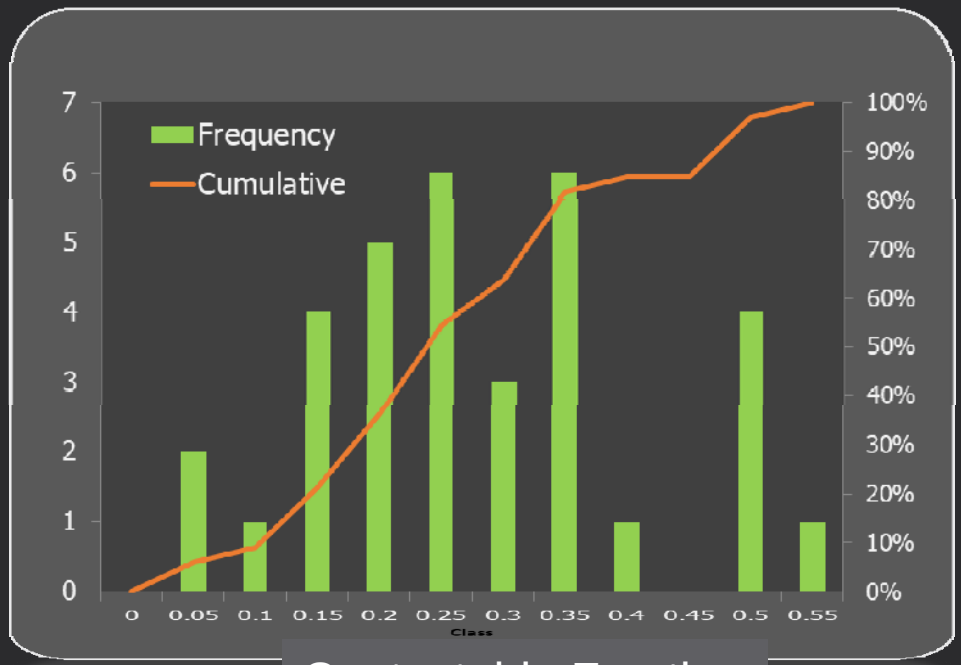
ormance of Historical Waterflooding Projects in GSJ

tor #2

table fraction (CF)



P_{50}= 25 %



Contactable Fraction

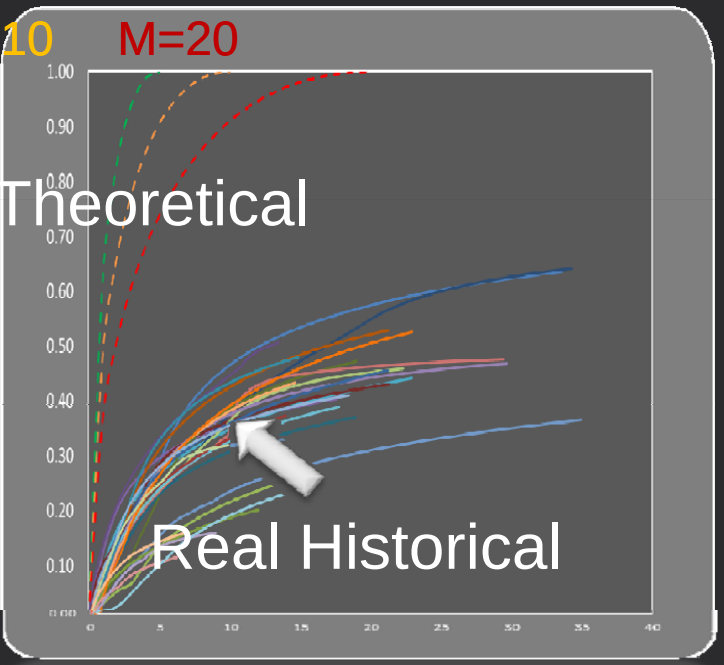
THE “VOICE” of EXPERIENCE

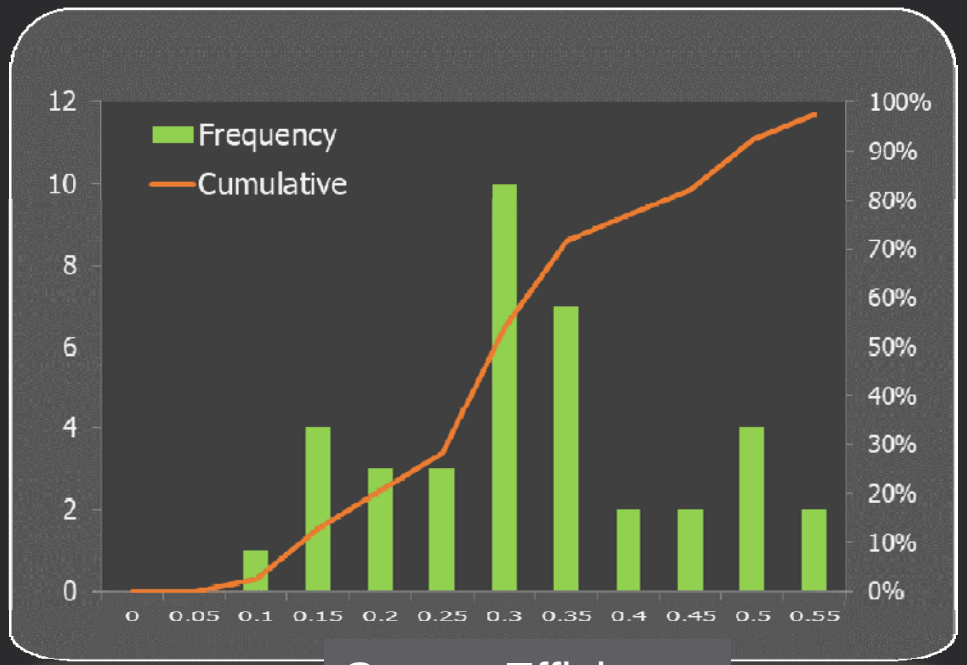
ormance of Historical Waterflooding Projects in GSJ

tor #3

ncies (Eff)

P_{50}= 30 %





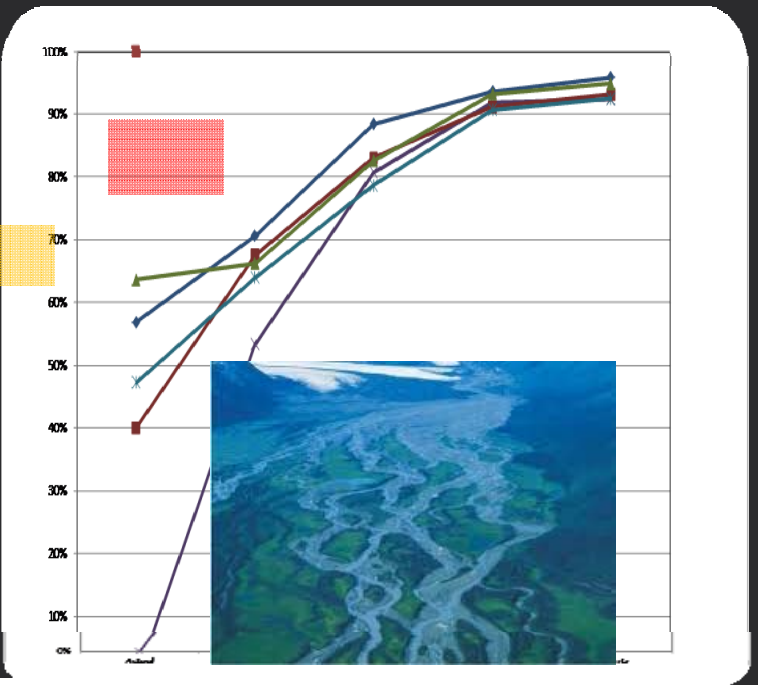
THE “VOICE” of EXPERIENCE

d Fraction depends mainly on Res. Architecture and Well Spacing

e Continous

12 %
#Reservoirs

50%
OOIP

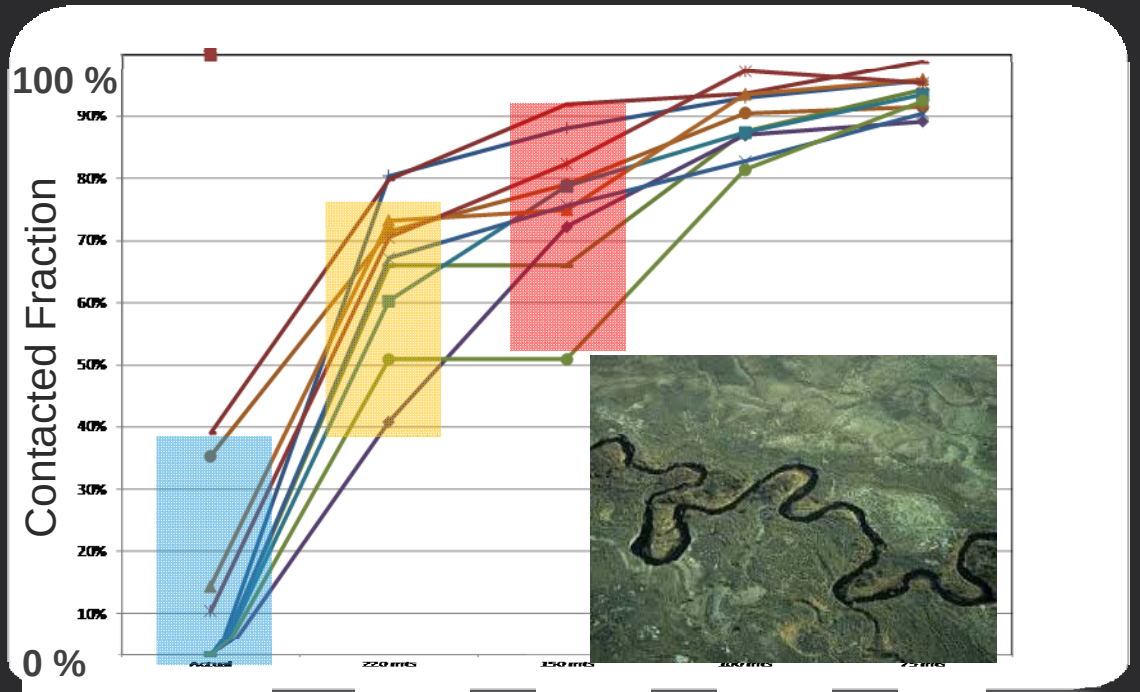


220 150 100 75

Less Continous

20 %
#Reservoirs

30%
OOIP

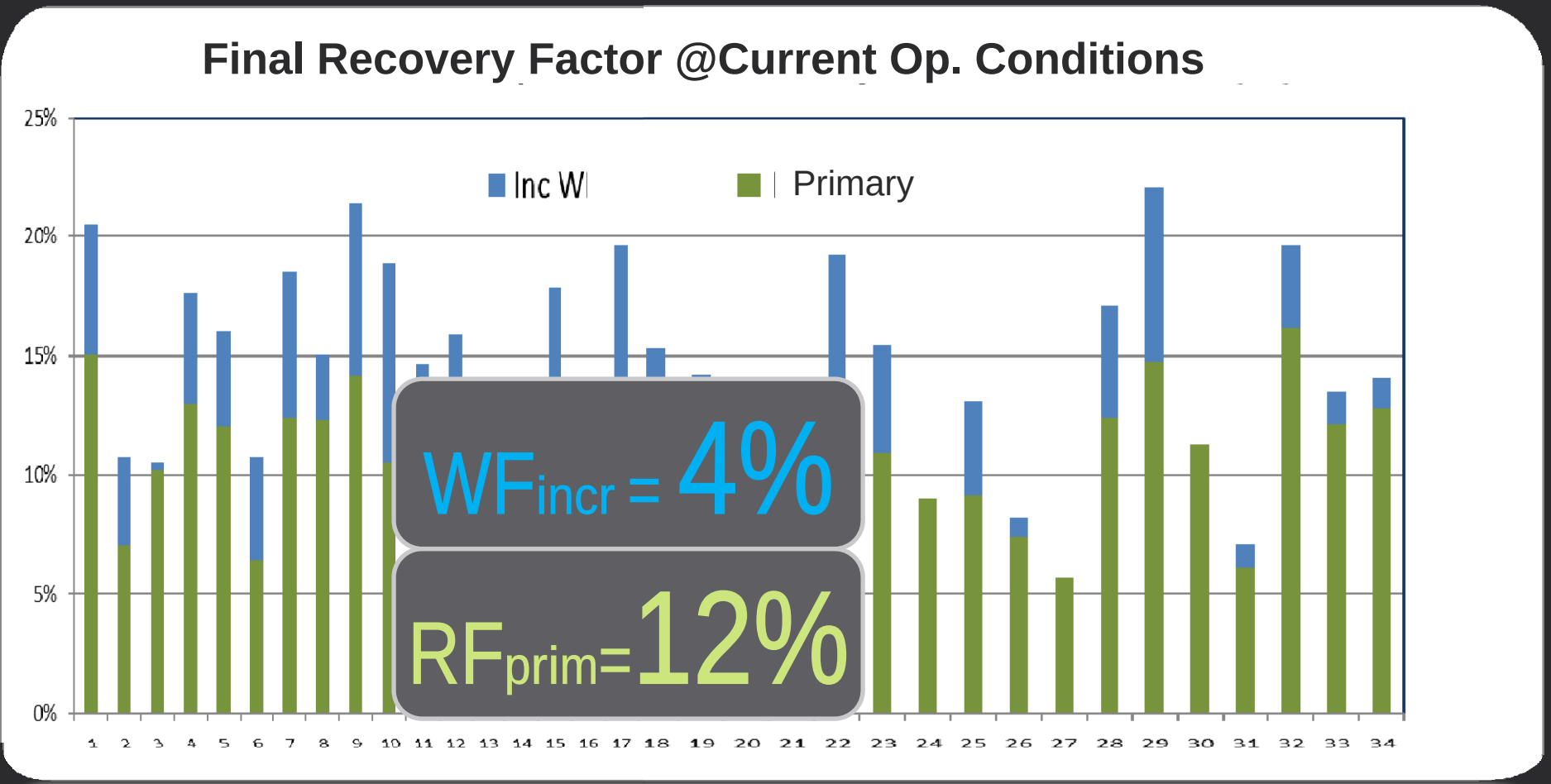


Current 220 150 100 75

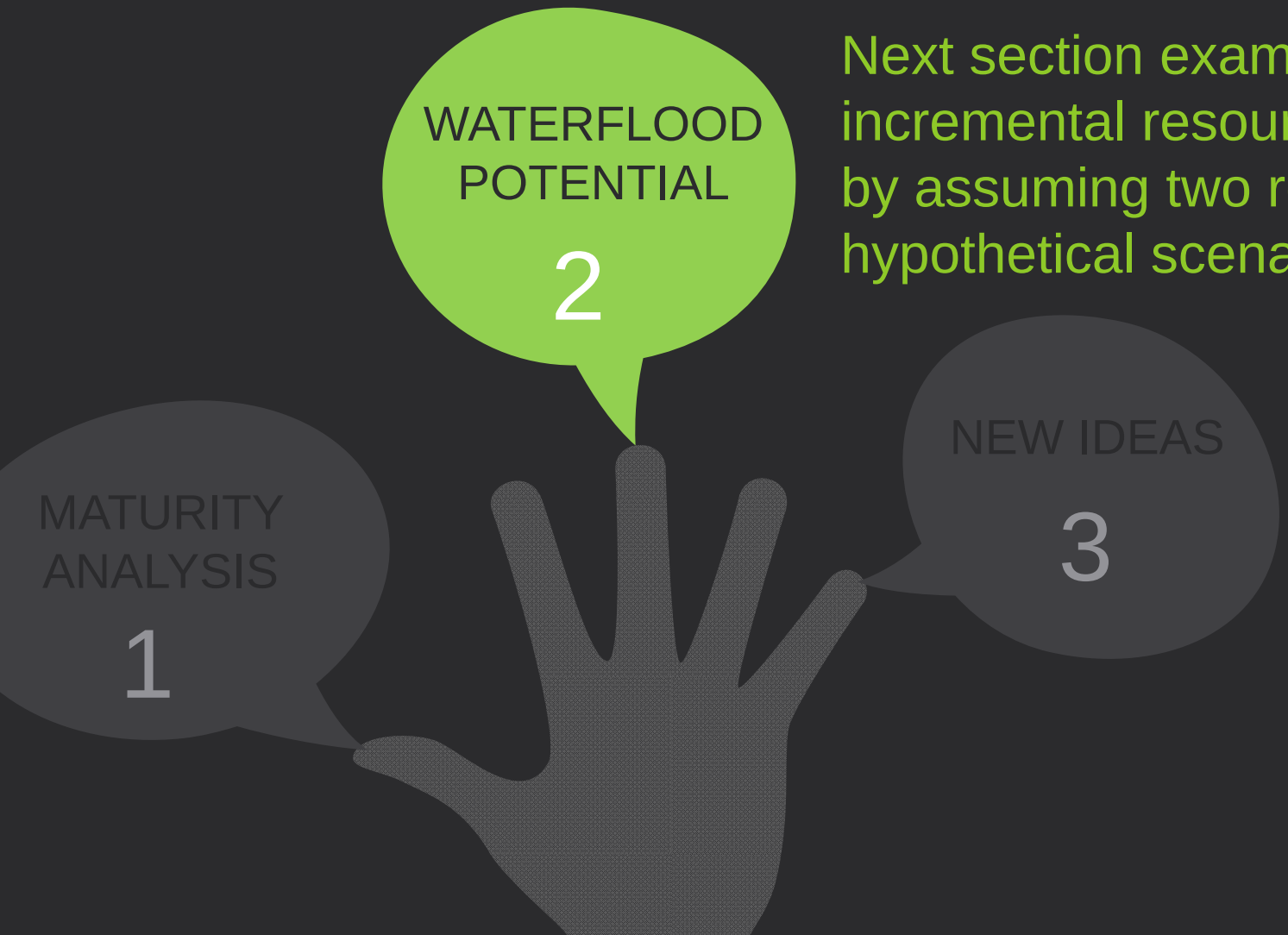

THE “VOICE” of EXPERIENCE
Forest and the trees….to make a DIME
~~roblems~~ Opportunities
DESIGN , IMPLEMENT, MONITOR & EVALUATE
Selectivity, confinement, Fluid Balance & Timing
Fluids
Mobility issues
Geology
Connectivity
Perms
Compart ments

THE “VOICE” of EXPERIENCE

ecovery Factors variation are mainly due to **DIME**



WATERFLOODING 2.0



Next section examines the incremental resources potential by assuming two reasonable but hypothetical scenarios

INCREMENTAL RESOURCES ESTIMATES

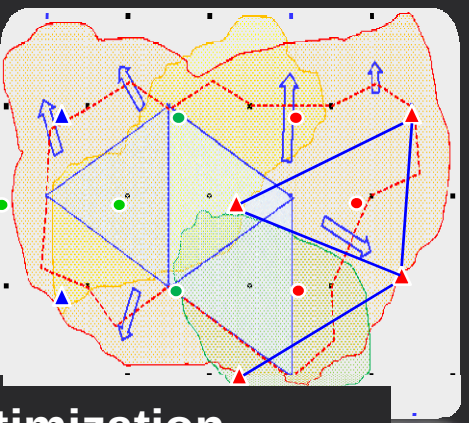
TWO DEVELOPMENT SCENARIOS

TIMIZATION (300 m)

ons (WO, CTI);

ntactable Fraction and

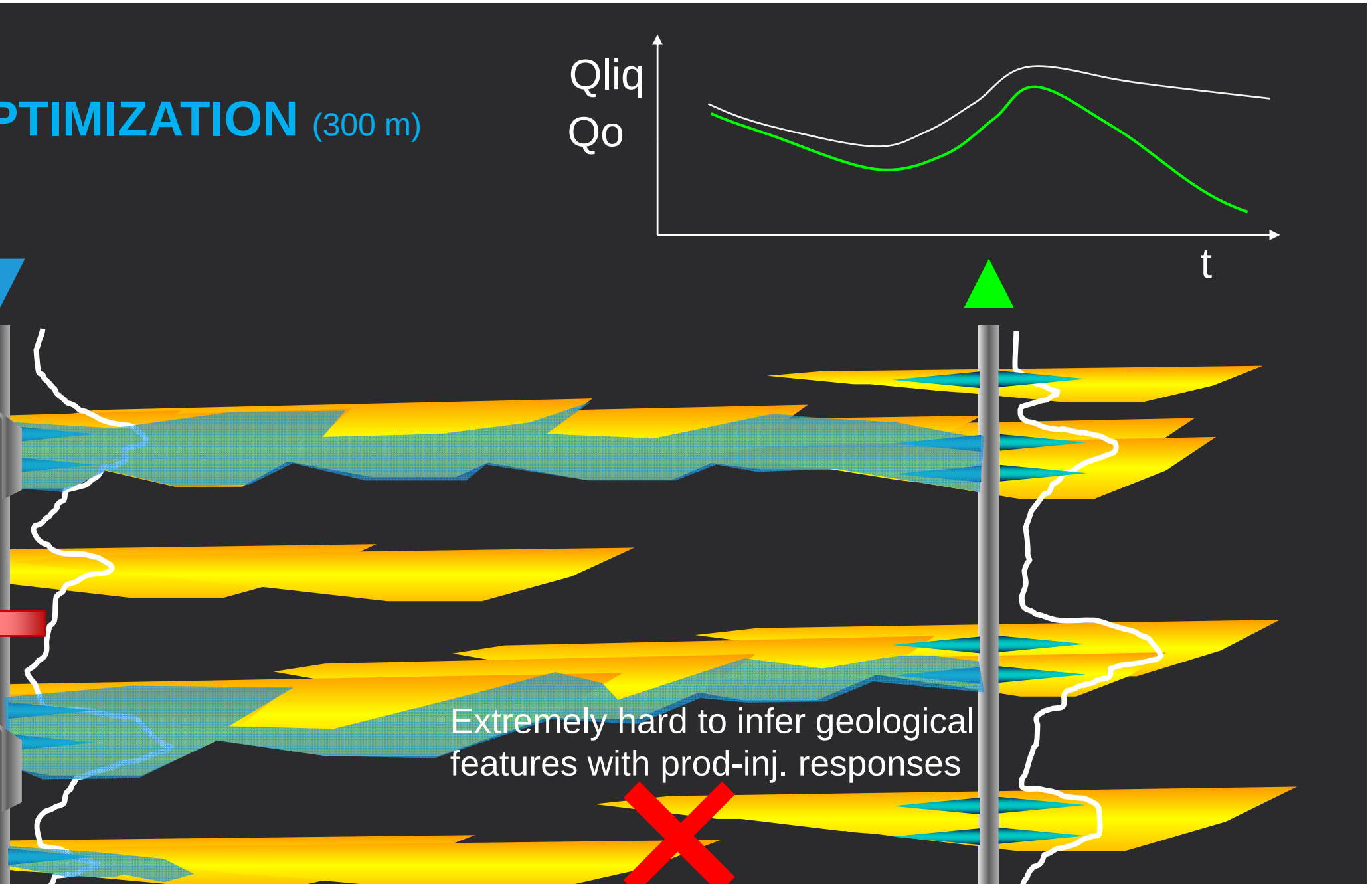
ciencies based on Experience



timization

← Scenario #1

Assumes average key parameters such as Contactable Fractions and Sweep Efficiencies. It also assumes no drilling (only workovers and conversions)


PTIMIZATION (300 m)
Qliq
Qo
t
Extremely hard to infer geological
features with prod-inj. responses

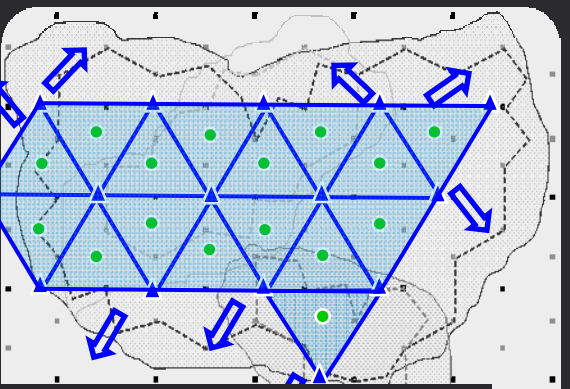
INCREMENTAL RESOURCES ESTIMATES

LL + OPTIMIZATION (170 m)

& recompletions; Assumptions

ntactable fraction

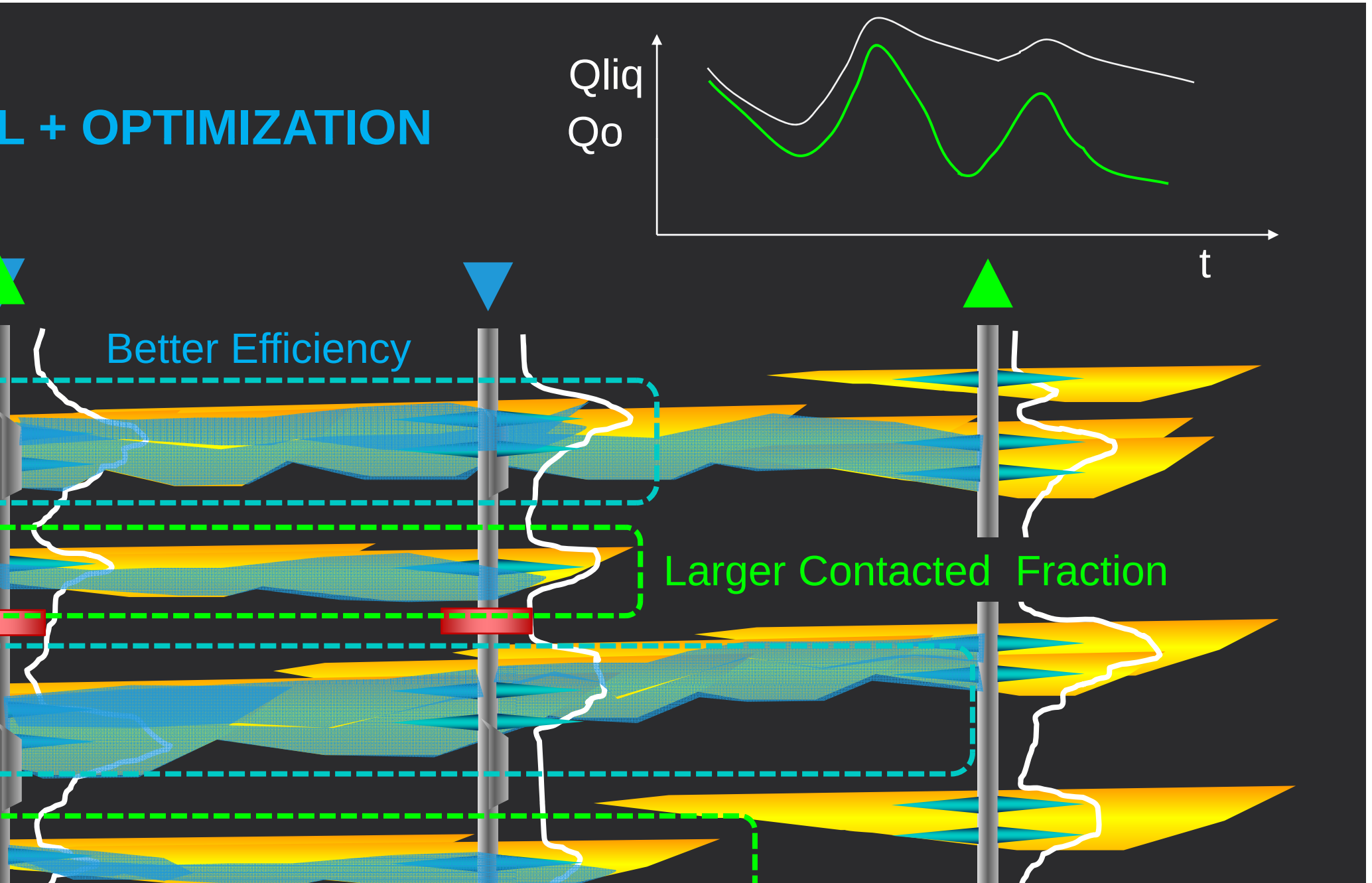
ciencies (displacement assumptions)



F Infill Development

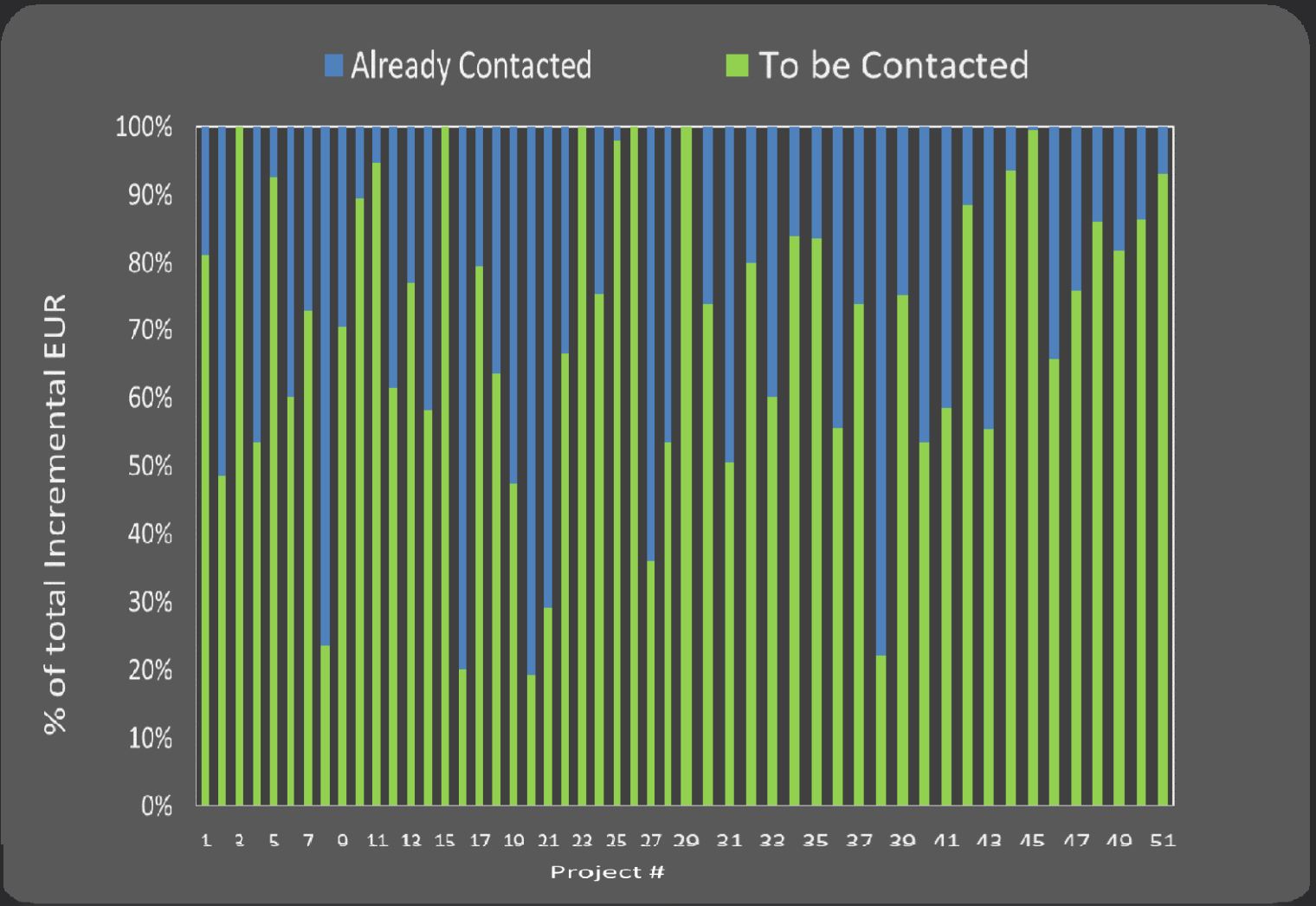
← Scenario #2

Assumes reasonable but higher key parameters (Contactable Fractions and Sweep Efficiencies) and injector infill drilling + workover + conversions


L + OPTIMIZATION
Qliq
Qo
t
Better Efficiency
Larger Contacted Fraction

INCREMENTAL RESOURCES ESTIMATION

ewly" contacted fraction represents 70% of the total increments



70/30

Ratio

Of Incremental EUR

INCREMENTAL RESOURCES ESTIMATION

RESULTS

rio #1- WF OPTIMIZATION

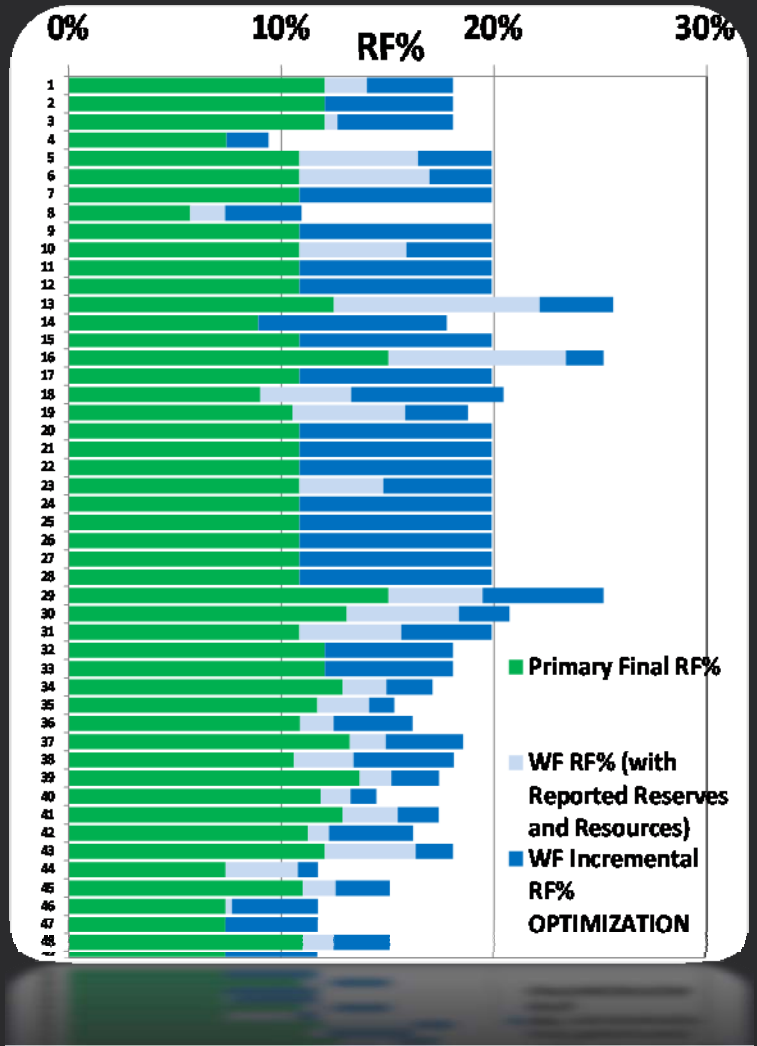
m3/job as cutoff

elds (out of 140)

MMm3 of incremental oil resources

rs. of current GSJ production

us in Conversions + Workovers



INCREMENTAL RESOURCES ESTIMATION

RESULTS

rio #2 - INFILL + OPTIMIZATION

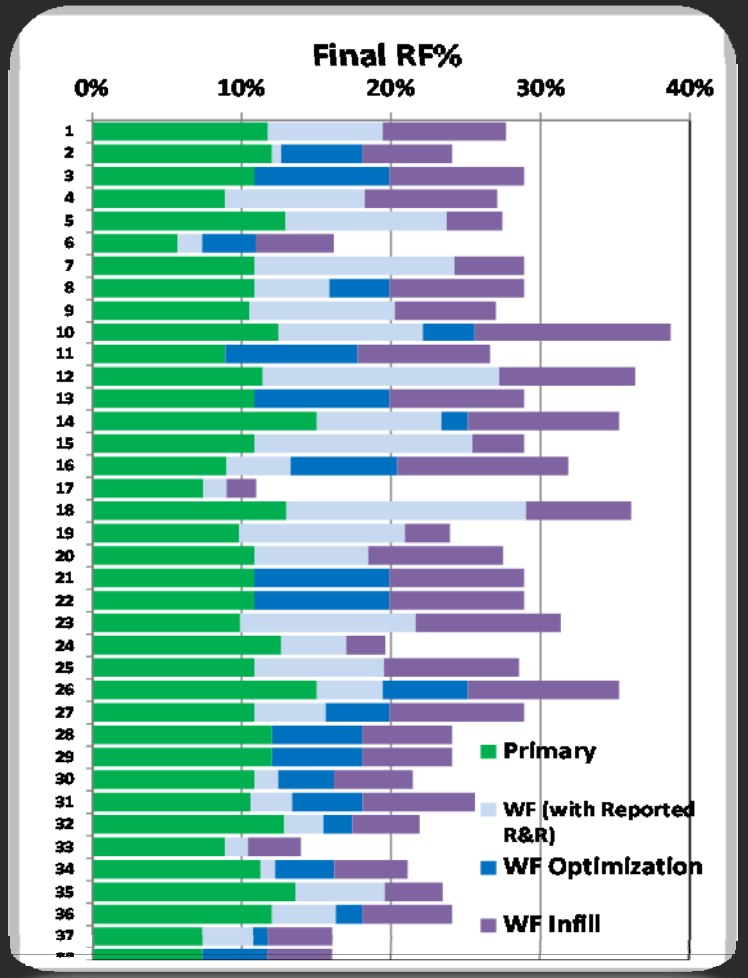
m3/job as cutoff

elds (out of 140)

MMm3 of incremental oil resources

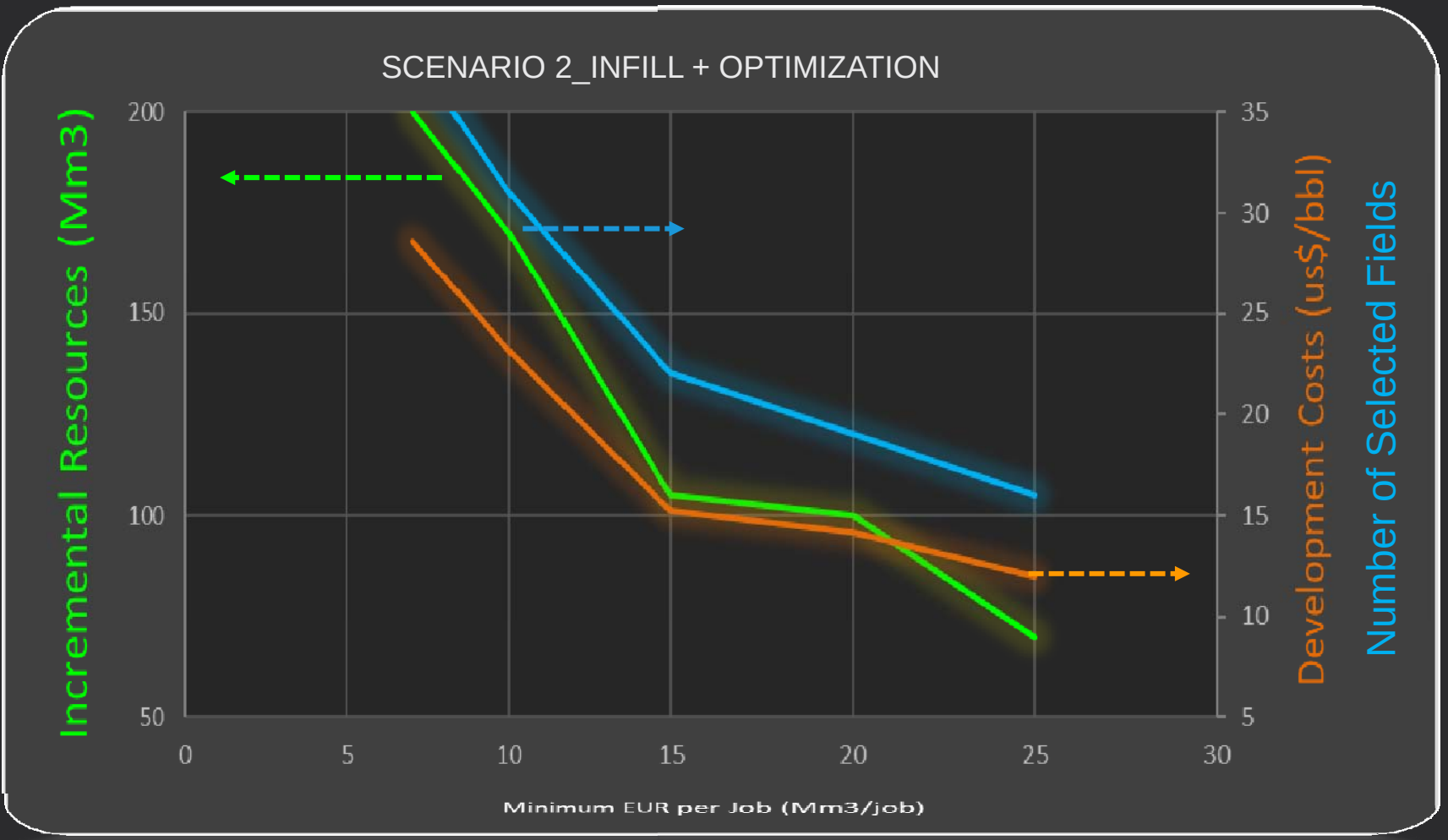
yrs. of current GSJ production

Bus$ (Infill Drill + Conversions + WO)



INCREMENTAL RESOURCES ESTIMATION

Sensitivity on Minimum EUR per Job



INCREMENTAL RESOURCES ESTIMATION

ASH FLOW ANALYSIS

assumptions

MMus$/well + **0.5** MMus$/wo

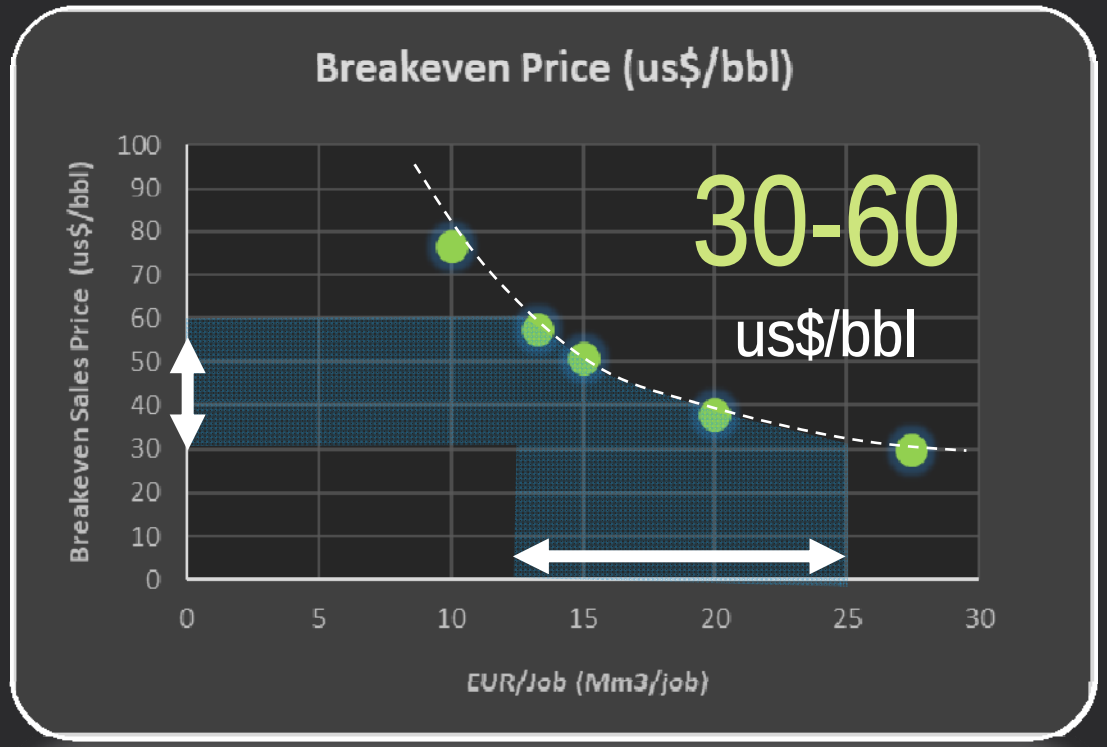
% Incremental Facilities

ental OPEX assumptions

Mus$/well/yr (Semi-FIXED)

Mus$/well/yr (VAR Well)

s$/m3 (VAR Total Fluid)



INCREMENTAL RESOURCES ESTIMATION

EAKEVEN PRICES – SHALE vs Optimized Waterflood

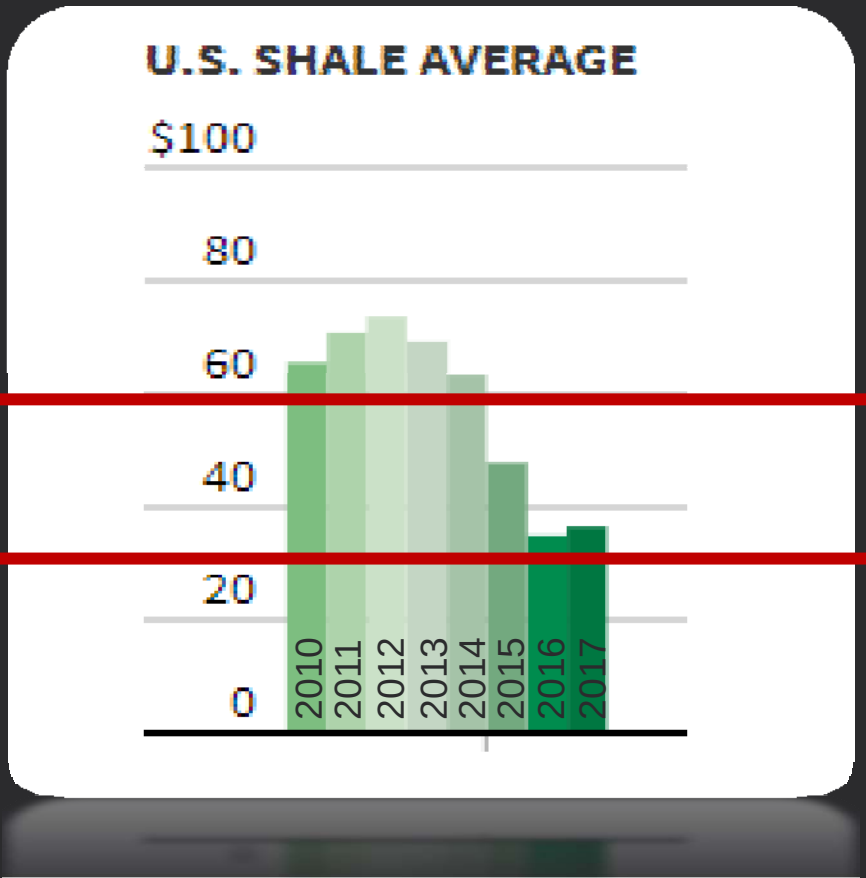
Increment EUR

Breakeven Price

Case → **not bad**

12 Mm³/job

60 Us$/bbl



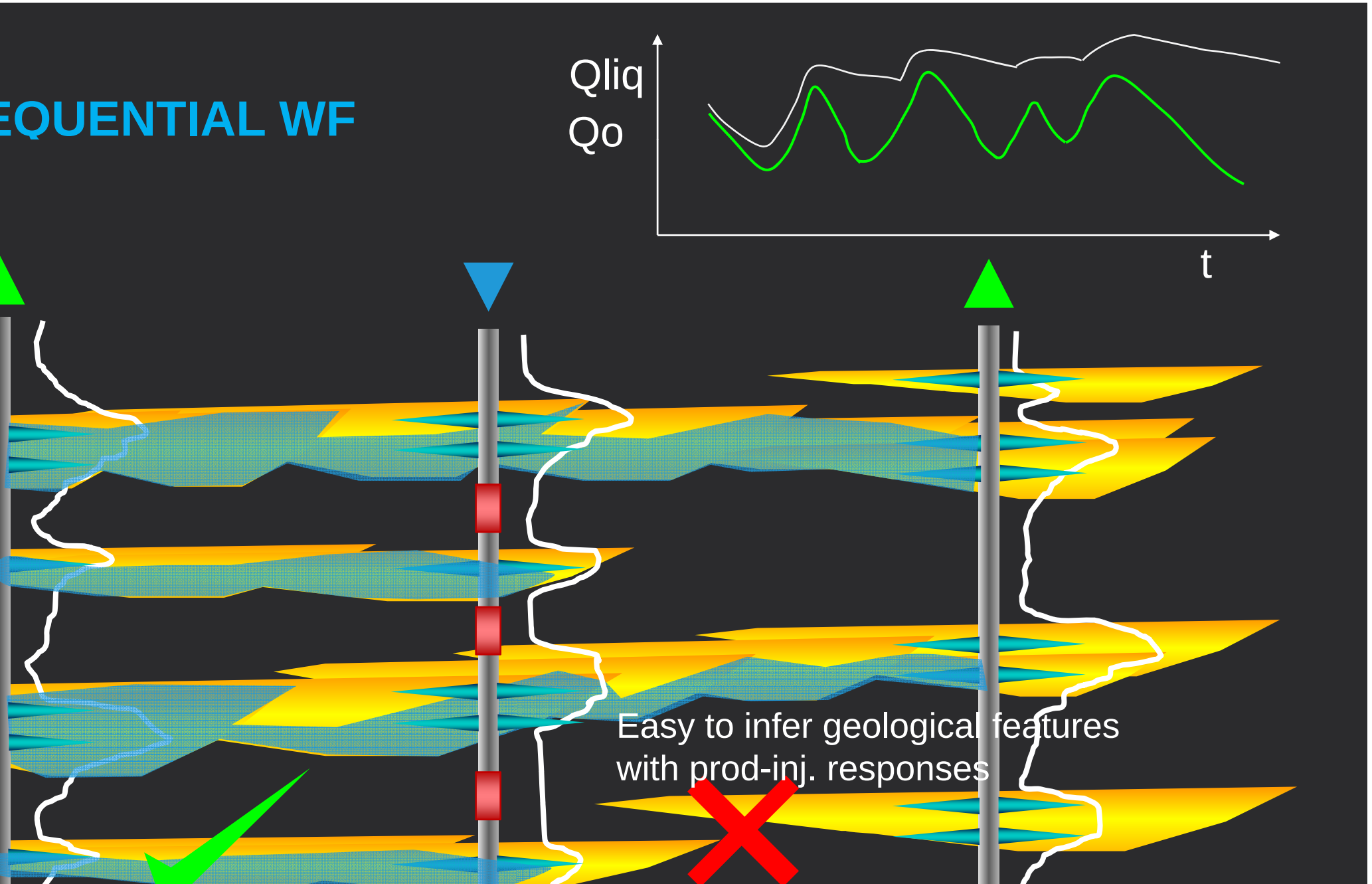
best projects →
rform US Shale's
breakeven prices

25 Mm³/job

30 Us$/bbl

WATERFLOODING 2.0

Next section examines an “out of the box” idea that might prove beneficial in various ways… could work or not depending on many boundary conditions


EQUENTIAL WF
Qliq
Qo
t
Easy to infer geological features
with prod-inj. responses

SEQUENTIAL WATERFLOOD

CEPTS

o **drill** a large amount of injectors → **LOW COST**

ers need **TOTAL confinement**

UP sweep sequence → **NO RIG** needed in INJ well

IME Inj. **monitoring** → Only a flowmeter and well head
ent pressure gauge needed

OST operation (handles lower rates and lower Watercuts)

SEQUENTIAL WATERFLOOD

S

e in both, **Contacted Fraction** and **Efficiencies** (1.5 - 2x)

e development: can speed up or slow down (**Factory Mode**)
ng on **market** or project conditions (Price, costs, etc.)

"PLATEAU" shaped profile → Optimize facilities

NANCIAL **RISK** → **Lower Capital Exposures**, as project is
nced

ANT ACTIVITY LEVELS → **foreseeable workforce** needs

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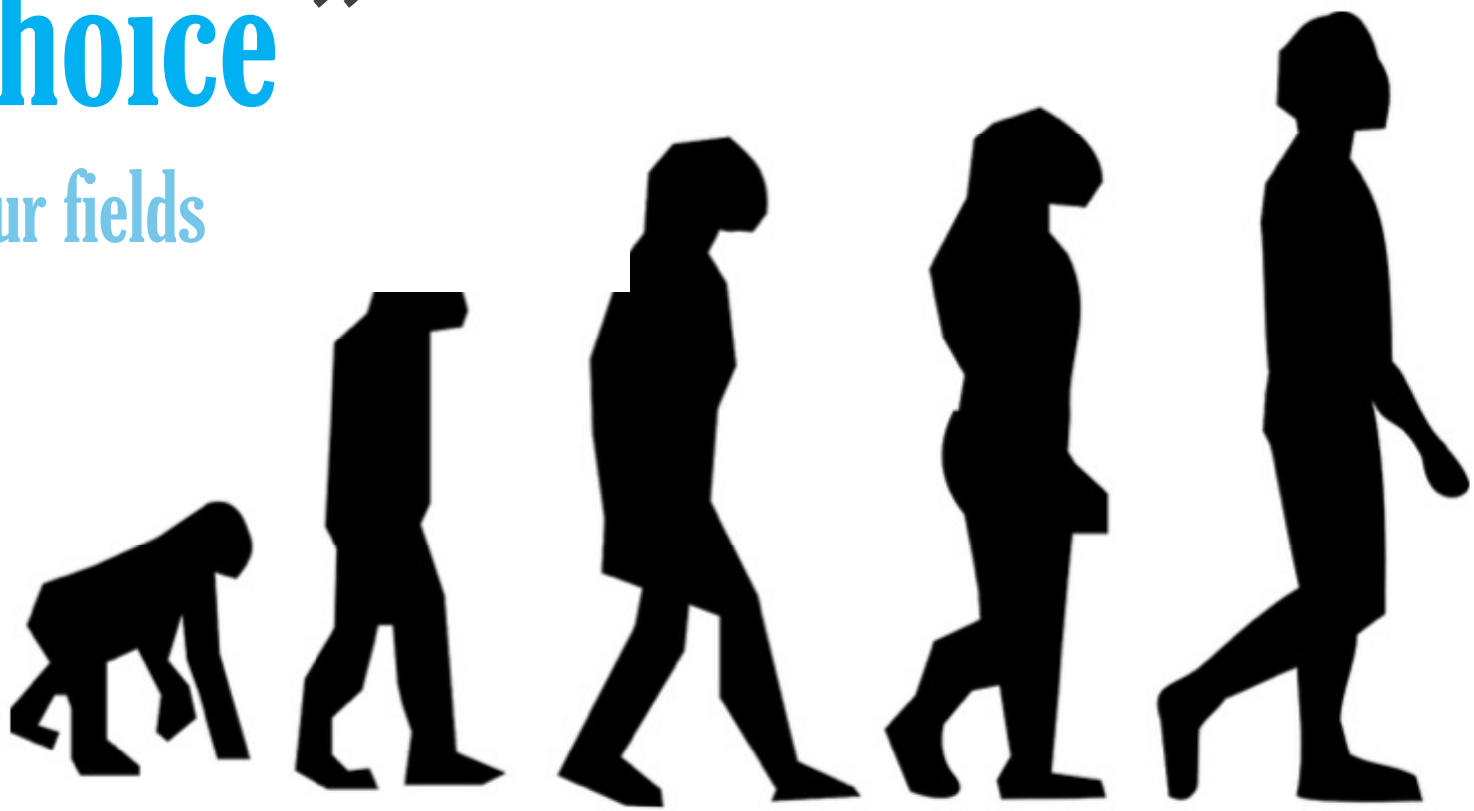
is Just a Number…

ity is a Choice ”

o wisely mature our fields



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