EARTH FORCE BUILD

Build Offsite

Organization for the EF Build launch.

>$100M
2028 revenue capacity target

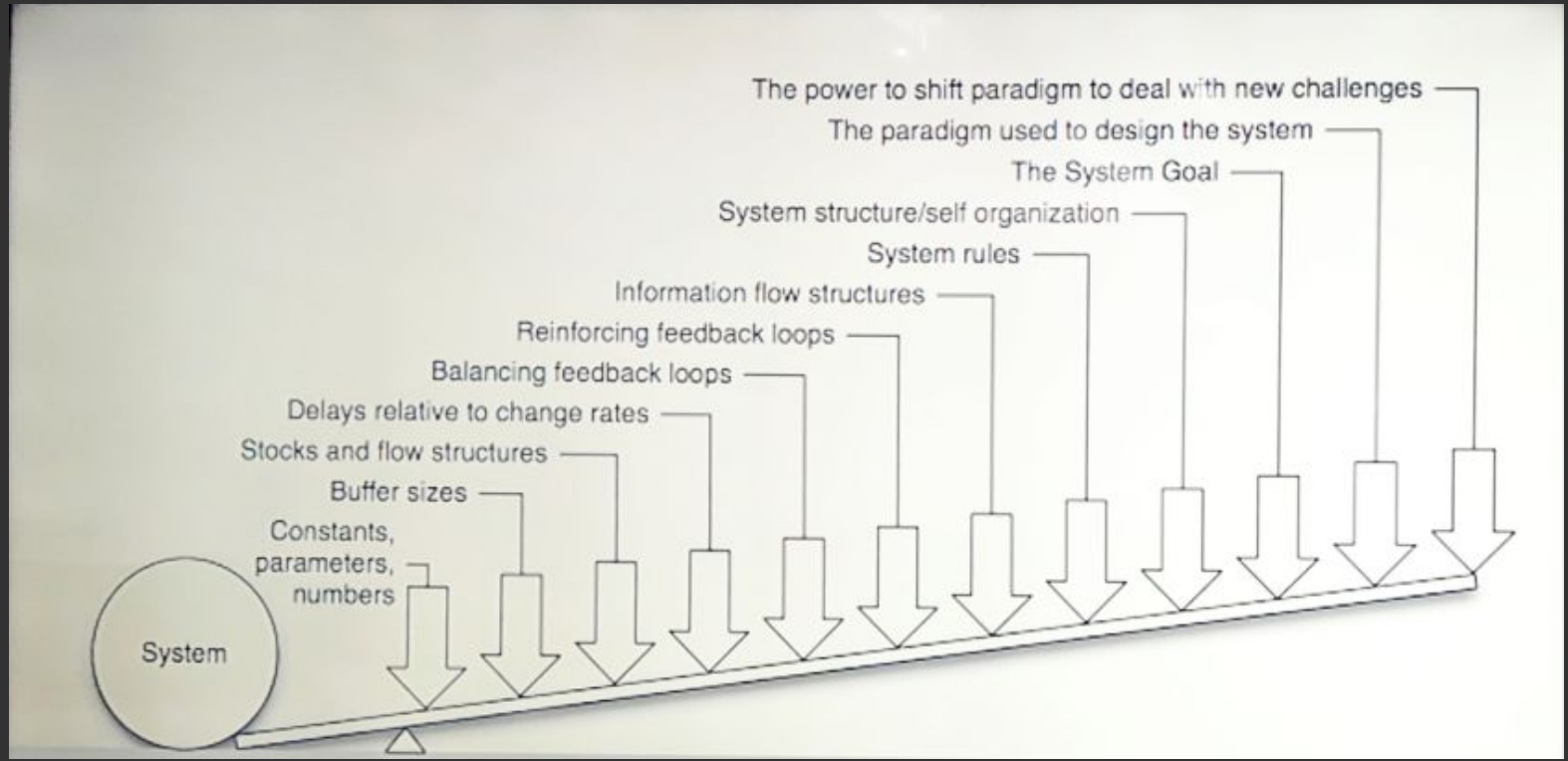
$220–280M
invested over 2 years

~$75M
investment by month 6

6 months
to the equipment gate

Purpose of this Off-site

We want to focus on the right, we've been peppered with questions about the left



How did I get here? What is this place?

Build BU as a System

1. The power to change the paradigm - this body, pre-work for this event
2. The paradigm used to design the system - pre-work, rules of engagement for this event

3. The system goal - output of this session / pre-work (refresher for this session)
4. System Structure and self-organization - output of this session
5. Information flow structures - output of this session

6. Reinforcing feedback loops - output of tomorrow's session
7. Balancing feedback loops - output of tomorrow's session
8. Delays relative to change rates - output of tomorrow's session
9. Stocks and flow structures - output of tomorrow's session

10. Buffer sizes - consequences of first 6-months
11. Constants, parameters, numbers - consequences of first 6-months

The Power

That us, folks.

We've assembled resources and people and capital and systems and demand for something better and synthesized it into a plan to make the world a better place.

That's on us.

Now we have to do it, we've got the obligation to deliver on this clear vision for a better future.

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Our Paradigm

Subverting the dominant paradigm for fun and profits

Our Premise:
If we can supply housing at cost parity with superior attributes around schedule, quality, carbon, margin, etc., we will sweep to dominance across North America. Also, a housing offtake is sufficient to pull through the fuels mitigation work necessary to unblock a flood of fiber from USFS lands.

Three parts:
1. Cost parity. If it doesn't pencil in excel is won't go.
2. Superior Ilities. We can do better than the status quo (shitty houses, extreme fires).
3. Achieving 1 & 2 leads to victory. More houses, better lives, less severe fire.

Presumptively:
1. The value exchange is activated by cost parity. Nothing else matters if you can't hit the mark.
2. Superior Ilities give us market differentiation and importantly margin on deliveries.
3. There won't be new obstacles to new housing or fuels work (e.g. NIMBYs can be contained).

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Our Paradigm part II

Being explicit

Hierarchy, Resilience, and self organization; it was *used* in the previous slide.

We mean to be open to discovery but start with strong opinions about what ought to be. Each element of the hierarchy supports the performance of the one below (hierarchy supports its subsystems objectives).

Sites support Nodes, Nodes support Cells. The decomposition of a unit into modules, assemblies, and sub assemblies supports federation of work and parallelization. The industrial advantage will not accrue otherwise.

But, we aren't scrambling in the dark here either. We have expertise enough to recognize that things can be better and that the work will not be easy, and sufficient love for the mission to see the change through to the end. We don't need to try every new thing; we already know what game we're playing and how to play it.

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Build Business Unit Goal

Defeat Construction, Mitigate Housing Crisis, A Pony?

Goals

- Defeat Construction: Reverse Housing Productivity Decline
  (Measurable impact on US construction metrics in 4 years)

- Address Housing Crisis: Increase the Rate of Housing Production
  (Measurable impact on US construction metrics in 4 years)

Non-Goals

- Revolutionize Organizational Management
  We need to be effective, not revolutionary

- Competition with existing US High Volume Housing Developers
  We hold ourselves to the Japanese and Northern European Standard

- Smooth revenue or market performance
  We are on a discontinuous control surface, we ought not expect a continuous response

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Strategic Intent

Taking goals down a level to specific objectives

Goal 1: High productivity building assembly
Goal 2: Improve housing production output

Intent 1: Characterized and certifiable platform
- G1: Construction status quo treats each project as a one-off with limited re-use
- G2: Constrained variability allows customization without breaking into certification and inspection jail

Intent 2: Designed and documented build system
- G1: Reuse and leverage of prior project processes and assets
- G2: Accelerates project pricing, evaluation, and permitting

Intent 3: Designed and documented production system
- G1: Cell-Node-Site coordination produces high throughput production chains
- G2: Prioritization of labor intensive process cells directly attacks housing labor costs

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Build Organization

The DAO of Build: Design – Assurance – Operations

In the first 6-months the feedback loops will be tight, developing the processes and practices that will be deployed when equipment and facilities subsequently begin to arrive.

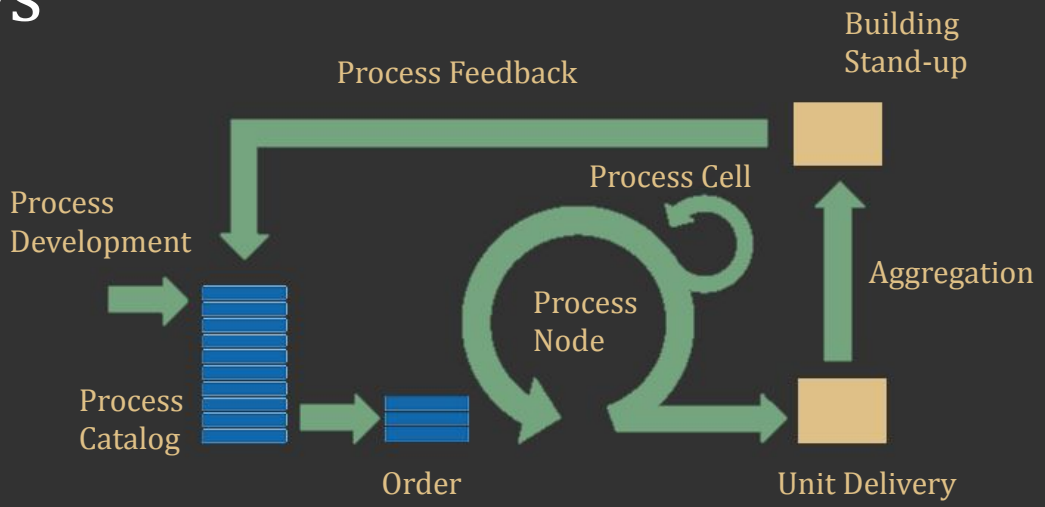
Design largely worries about the build system itself and how we achieve our strategic intents. The domain extends over Manufactured Products, Process, and Policy Development. Areas of Governance, Certification, Regulation, Technical Release and Change Control.

Assurance connects planning to performance, worrying over the feedback systems coordinating intent. The domain extends over quality, traceability, requirements, records, evidence, deviations, and responses. Areas of digital backbone, integration, process and system of record structure and governance, auditing.

Operations is the full business unit accountability. This combines contract authority with factory production and site construction.

Build Information Flows

Feedback and feed-forward



The triad works at different times

- Design *develops* a process.
- Assurance *validates* the execution of that process.
- Operations *performs* the process to satisfy a customer contract.

We have a major feedback cycle to update the process itself.
We have a minor feedback cycle to respond to performance in near time.

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Build Information Flows

Feedback and feed-forward

Reinforcing Flows

- Cycle Time (Node)
- Value at Contract Occurrence (Offtake)
- Value at Transformation Occurrence (Process)
- Deliveries (Product)
- Utilization (Build System)

Balancing Flows

- Waste Rate
- Error Rate
- Queue Depth
- Inventory
- Cost and Margin

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Build Feedback Latency

How long does it take to respond to the signal? De-risking big decisions.

Continuous
The Process-in-Development feedback loop is tight, a Node may go through several iterations in a single day as the rules for subsequent performance are being worked out.

Monthly
Batch and Cell Performance

Quarterly
Contracted Delivery

Yearly and beyond
Initial contract delivery
Equipment purchasing

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Stocks and Flow Structures

We have a sophisticated understanding for CLT, now extend to everything else!

Kanban isn't sufficient. We need to balance cost of inventory to throughput to latency (use and new deliveries) to vendor risk (source, replacement quality and cost).

Different nodes and cells will require different queues and materials.

We have thoughts about vertical material handling and sub-line management that are uncommon in US manufacturing - executing these plans won't be free or low-hanging fruit and will place demands on early staffing decisions.

This will also require a certain amount of free cash to manage these assets, this is essential and drawing dry into any of these queues can compromise delivery for completed units. You can't ship (generate revenue) without the required bill of materials, we ought not ignore the balance sheet implications here.

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Customer Roadmaps

Customer Development Constraints for EF Build launch.

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What Market are we in?

Why Modular Housing, anyway?

At the core we have a mass balance problem.

The forests have too much biomass, biomass with no economic destination, increasing catastrophic fire risk and retarding progress against that obligation of land stewardship.

Modular Construction addresses a pressing market crisis (housing availability) while leveraging the dimensional control and stability of mass timber (forest biomass outlet).

We need more houses and less severe fire, both ends of the system are in alignment when we combine.

Are we in the single family detached market? No.
Are we in the stacked flats or 3-story garden walk-up market? No.

We are in the modular construction market and that has a variety of channels that leverage the same components. Residential, Industrial, Apartments, Passivhaus, etc.

We are like LEGO, they aren't in the Ninjago or Architectural Models markets, they make toys and those toys come in many different forms from a limited set of constituent parts.

System Response

What kind of control surface is this?

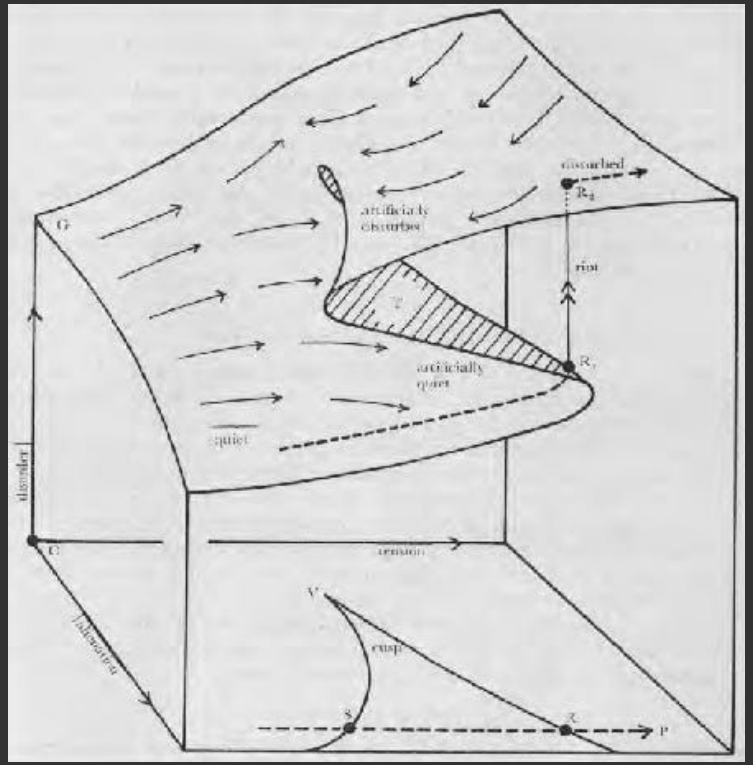
We are not on a smooth control surface, we face irreversible steps along the way.

Small adjustments may not have an impact, up until the threshold is reached and then they decide all.

We cannot presume a smooth response.

The least painful thresholds will be daily penalties for non-delivery of contracted number of modules that will easily eat all margins from months of operations.

We have to sweat the details and consequences in detail.



2-Years to Break Out

Where does the money go?

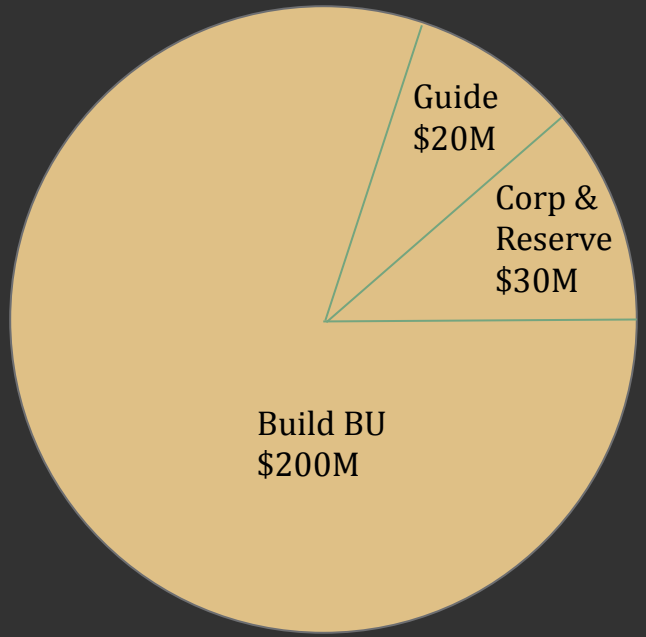
We need to succeed without going over the number, this suggests operating with a safety margin.

The thing we are doing is challenging, which suggests we'll need everything we can get our hands on and should operate without a safety margin.

The squaring of this circle requires that we limit scope and scale-out. In the next two years we have just enough time to build a factory, we won't be pulling steady revenue from it yet.

Forest Technology has a break-out trajectory but needs resources to achieve future positive revenue.

Corp will have non-zero costs, and mostly holds our safety margin.



Relationship between Margin and Volume

Industrialization increases the y-intercept | Markets have different depths and entry requirements

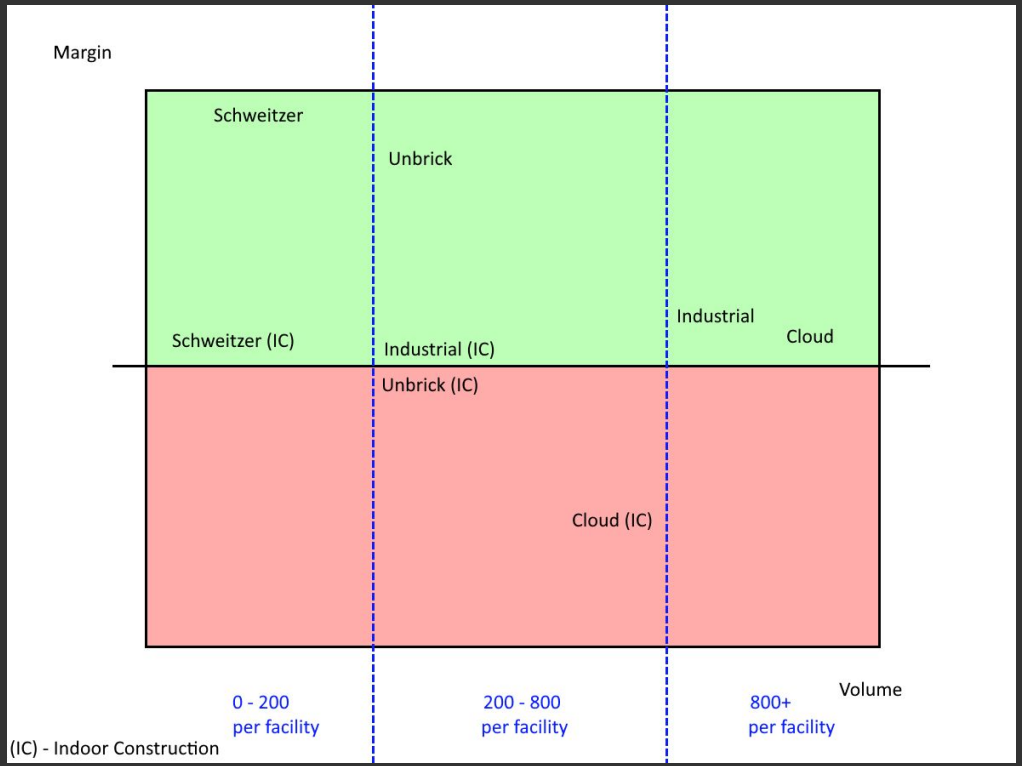
The depths of various channels and customers are not the same.

The activation required to move a customer down the funnel is not the same.

The value on offer for getting really good in one channel or another is not the same.

Simplification masks essential complexity.
But, to simplify:

If you can only do a few, do Schweitzer.
If you can do vast quantities, do Cloud.
If you need to mass balance, do Industrial.

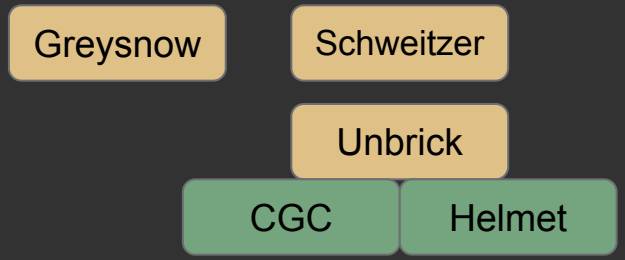


Customer Acquisition Funnels

Luxury Detached Single Family

Examples: Unbrick, Schweitzer
Funnel:

Initial Outreach > LOI > Validate Product > Build Prototype > Land Pilot > Contract > Renewal



Justin Stewart - Please elaborate

Customer Acquisition Funnels

3-Story Garden Walkup

Examples: Schweitzer Greysnow
Funnel:

Initial Outreach > LOI > Validate Product > Build Prototype > Land Pilot > Contract > Renewal

Greysnow

Schweitzer

Justin Stewart - Please elaborate

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Customer Acquisition Funnels

Stacked Flats

Examples: Cloud
Funnel:

Initial Outreach > LOI > Validate Product > Build Prototype > Contract > Renewal

Cloud

Justin Stewart - Please elaborate

Customer Acquisition Funnels

Industrial Roof and Wall System

Examples: AT Industrial, AMZN
Funnel:

Initial Outreach > LOI > Validate Product > Build Prototype > Land Pilot > Contract > Renewal

AMZN

Knife River

AT Industrial

Meta

Justin Stewart - Please elaborate

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Channels to Market

Pathways to the Pipeline

Self Development: e.g. Schweitzer
Sell at the Door: e.g. Cloud and Unbrick
Sell through a Partner: e.g. Knife River

A common start for any market:

The New Product Innovation pathway leverages our build system and the particular requirements of the project to define the manifest of components required to produce the required projects. New process cells will be identified, if necessary, and scheduled for development before the production run is attempted. Prototypes or pilots may be ordered, and once delivered we will be ready to produce.

After the first customers, our prior performance will allow us to
development work, but for early customers we will have to fro
a catalog of reference parts for subsequent customers to leve

ut

Justin Stewart - Please elaborate

Critical Facilities

Welcome to Spokane (and Pullman)

- **Mercer**, and its augmentations, are on the critical path for all our product lines.
- **Factory 0** is the place where prototypes and small volume pilots are produced, and is on the critical path for all process cell development and automation advances.
- **Assembly 1** is on the critical path for high volume production, anything above 1,000 units / year.
- The **R&D Lab** is where regulation, policy, certification, inspection, and materials development sits. This unlocks both immediate and long term value.
- **ThinCLT** production improves all products and is essential for Industrial product lines. We have first mover opportunity here, if we move without delay.

The **first two** are immediate.
The **third** requires immediate action to land in 2 years.
The **last two** present optionality, how big and how quickly we make the investments have some flexibility in exchange for downstream market risk, ceding first mover advantage, or funding from revenue. The best path for success suggests immediate action.

CapEx

Which lines are first, which gener  *ontracts?*

$20M ThinCLT - US Differentiation prerequisite for Industrial markets
$30M CLT Factory - We have improvements we'd make to Mercer, but we need the capacity
$15M Assembly Factory - Assemble the Modules
$10M Process Dev Facility - Banana Factory, create the processes
$8M Resia Automation - Automate the processes
$15M Certification and Materials Lab - Regulatory and Policy Wins

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$90M w/o buying out Mercer. This spend is spread over 24 months.

$90M Mercer
$15M In-Market Assembly

Out of cash.

This is about it for the story.
We don't have a lot of innovation (10%) in this budget vs. execution (90%).

Early Production

Factory 0

The earliest prototypes will look like construction indoors, taking CLT billets or rough shaped components from Mercer's existing capabilities and manually assembling units for Cloud, Schweitzer, and Unbrick.

The Industrial prototype will leverage a european CLT supplier to get the desired material, it is unavailable in the US until someone starts producing ThinCLT (ideally, that's us). We will take these billets and produce a temporary canopy in the laydown yard at Factory 0 which will show-off our build system as well as provide covered exterior storage.

Factory 0 will ramp up to a unit a week in order to validate process cell development activities and produce pilot units for Schweitzer (10-15 for March) and Unbrick (3 → 10 → 50 as we can produce them).

Prototype units will remain in Factory 0, as walk-through demonstrators and test-beds for ongoing development.
Pilot units are delivered to customers and inhabited, Pilot units are paid product.

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Steady State Production

When the system is running

Delivering product against contract requires both throughput and storage. A 250-unit Cloud Apartment building will take delivery over the course of 2 weeks, building a facility that could produce 125 units per week would make that facility a top 15 US housing developer by itself - that's just not where we start.

The steady state looks like: In-market assembly facilities producing 1,500 units per year (30/week), aggregating components and modules produced in other specialized facilities (such as Mercer), to bring together a constant stream of components to be assembled into stackable modules. Once clearing the production line, they'll temporarily queue in another facility proximate to the project awaiting assembly.

In the best world, we sell them as they leave the assembly facility and the transport and storage is outside our envelope of responsibility. In the expected world we'll sell them as they leave the temporary storage facility and we'll hold liability for their condition up to stand-up

Justin Stewart - Please elaborate

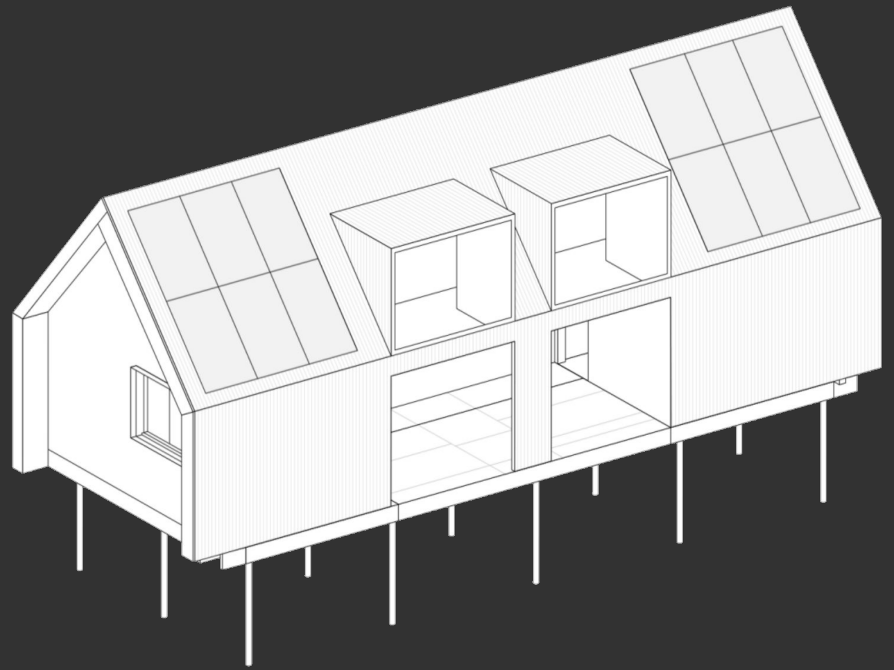
Unbrick

Self-Sufficient Passivhaus - Luxury single family residential

Calendar Order of Build

- 0-18: Early prototype for production sign-off, then steady small scale production
- 19-36: Ongoing small scale production
- 36+: Ongoing small scale production

Unbrick is a complicated, high BOM product, with many labor intensive elements and finishes. It will be a useful benchmark for automation of manual processes, but difficult to pull consistent margin from (sensitive to any and all changes, most reliable components are small share of BOM).



Schweitzer

Ski Resort Escape - Luxury Second Homes

Calendar Order of Build

- 0-18: Build out 10-15 units for March 2027 Pilot Deployment
- 19-36: Build out luxury cabins and garden walk-ups for seasonal deliveries of 10-15 units
- 36+: Ongoing, with additional Ski Resorts

Schweitzer, and related developers, provide an excellent high margin low volume outlet for our build system. Less complicated than the Unbricks, in locations with far higher premiums on the location, these units will have less competition and our build timelines will stack favorably vs. alternatives.

Cloud

Apartments - Studios to 3-bedroom apartments in sets of 250 or more

Calendar Order of Build

- 0-18: First Prototype units, 2x2 stack, to develop the MEP integration
- 19-36: Bulk volumes, unlocked by completion of Assembly 1
- 36+: Cloud units, in bulk, through in-market Assembly Facilities

Need to work on MEP integrations and process development around this stringent requirement.

Can’t deliver individual units, large batches required.

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Industrial Roof and Wall System

ThinCLT and Low Carbon Alternatives to Steel and Concrete - Individual land managers, Hyperscalers, Knife River Partnership

ThinCLT

- 0-18 months: Import from Europe
- 19-36: Build at Mercer
- 36+: Build next to Mercer + other locations

Commercial Channels

- AT Industrial
- Knife River Prestress Hybrid System
- Hyperscaler Datacenters Standardization

Thin CLT gives us a technical advantage and helps us convince Hyperscalers to establish our standard. Developing the Knife River Prestress Partnership is critical here.

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Interdependencies and Development Paths

Do each of the pieces bring us closer to the end?

A factory finished unit needs all the parts of a home, but delivering those parts without using our process cells avoids developing the value in the customer value proposition.

Cloud is the first Prototype, because the MEP integration is essential to develop and test, but complicated.

Industrial Roofing and Wall systems are next, because they are a simpler production chain using components common to other designs. We also need the roofing system for our new facilities, and have an available offtake for whatever we can build here. This channel to market also requires the most new work to develop from the business side.

Schweitzer and Unbrick are next, both being luxury detached single family home designs. These will require the most refinement and largest number of diverse process cells to support those higher end finishes. They can be produced in smaller volumes, and this lets us juggle process cell development and unit production in the Factory 0 facility.

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Logistical Chains

Facility and Investment Paths for EF Build launch.

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Logistical Chains

CapEx Planning

Timeline Drilldown: 0-6, 6-18, 18+
Exploration by Facility

Because of the modularization and Build System approach, nearly all CapEx investments support all four channels to market. The residential units tend to get more from the process cell development and automation, while the industrial roof and wall system unlocks full value from the CLT focused supply chain logistics support. We already have competence in the CLT logistical chain, we should leverage that early.

The correct[1] investment order is sensitive to machine order timelines, availability of alternative suppliers, and urgency of customer engagement.

[1] There are a variety of values for Correct here in our context. Many paths are viable, the urgency and timeline of some customers are not yet fully understood.

Risk Map

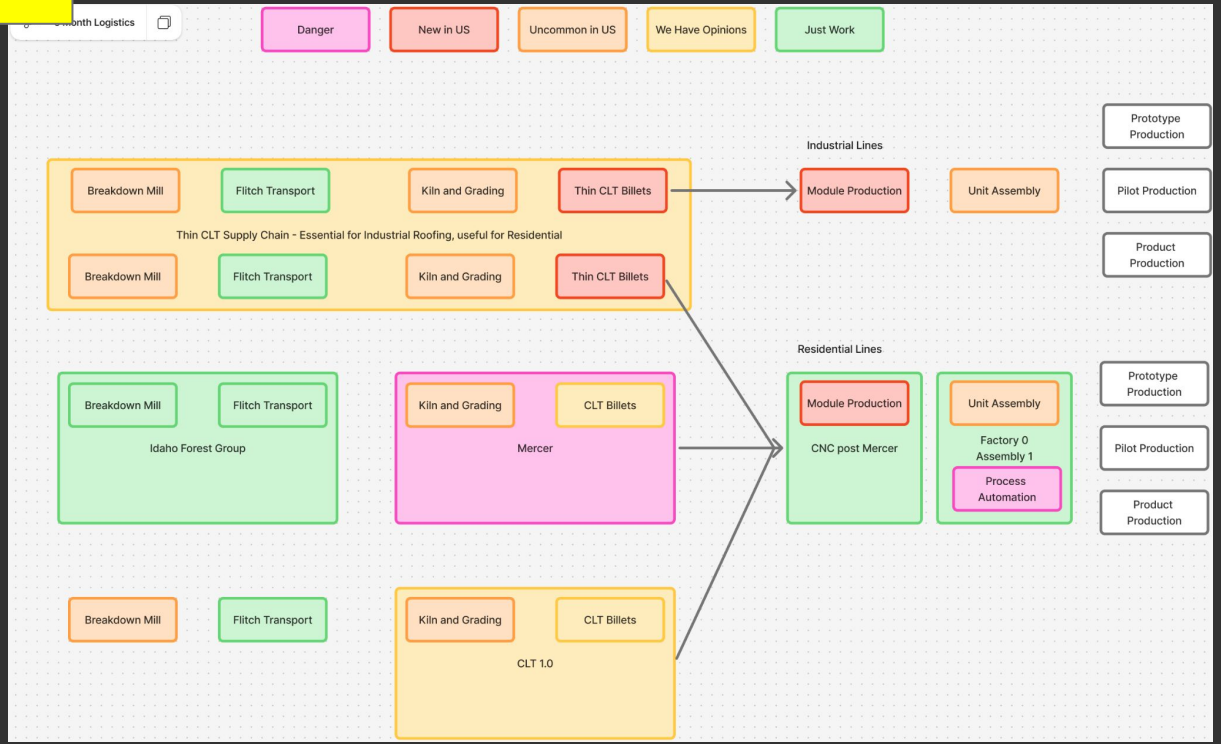
Across the different product chain

In many places we are just bringing known practices from Japan or Europe to North America.

We have a few places for innovation, either in NA or a Global context.

Mercer and Resia represent external risks that increase costs and delay timelines.

Note the different products all use the same components and modules, shred infrastructure.



Factory 0

Process Development and Early P

Case 1: $18M
- $10M - Process Cell Development in the Montgomery facility
- $8M - Resia + Relocation

Case 2: $30M
- $10M - Process Cell Development in the Montgomery facility
- $20M - Process Cell Automation R&D in the Montgomery facility

The Resia purchase saves us money and significantly *time*.

All prototypes, all Process Cell Development, most Pilots and some early production will come through Factory 0. When we update the assembly facilities, it will be with new processes developed and validated at Factory 0.

Certification and Materials Lab

The Build Labs Investment: Two in

Cheap: $5M and time-share with WSU's facilities
In-House: $15M own capacity, facilities, demonstration sites

We prefer the In-House path, which establishes our own facilities and avoids waiting in the queue for available facilities, staff, or equipment. The first decision here is where to send the Fill Demo Saw, ~$200k commitment but it must physically sit somewhere; somewhere with access to a press, input materials, and testing. Leading candidates are Spokane in Factory 0 and in Pullman at WSU.

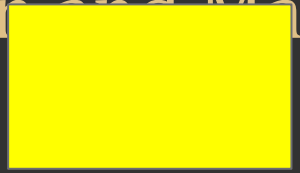
Materials and Certification Labs

Developing Strategic Advantage

1. Qualification of Process / Process Cell Catalog
2. Regulator Perception - code report generation
3. Employee onboarding, training, and education
4. Customer visualization, confidence, assurance
5. Develop Strategic Advantages
    a. Ponderosa Pine Utilization
    b. Waste Stream Optimization
    c. Resaw and adhesives innovations
    d. Low Voltage Electrical systems
6. Guaranteed Capacity
7. Fiber Security and depot optimization
8. Field Optimization and factory to forest feed-forward and feedback loops
9. Optimizing Logistics - routing the highest and best use for raw materials
10. Speed, cost, capabilities vs. 3rd party lab access

Certification and Materials Lab | Flow

Order of Operations



1. CLT Carcass Components - Code Reports
2. Adhesion on direct sawn surfaces
3. Lamstock and Electronic Grading
4. Roofing System standardization with Amazon and Meta
5. MEP Integration and Process Development
6. Ponderosa Pine for Lamstock
7. Identify our Materials | Invent New Materials
    a. (R&D) Woodwool - waste stream, insulation (Knife River), acoustics, fire barrier (1” non-combustible - alt mineral wool)
    b. Acoustic
    c. Seismic
    d. Fire Barriers
    e. Weather / Moisture

CLT 0.5 - Ingestion

Grading, Merchandising, and Humidity Control for existing Mercer CLT Facility

$20M

- Kiln
- Grading
- Finger Jointer
- Merchandising
- Conveyance
- Storage

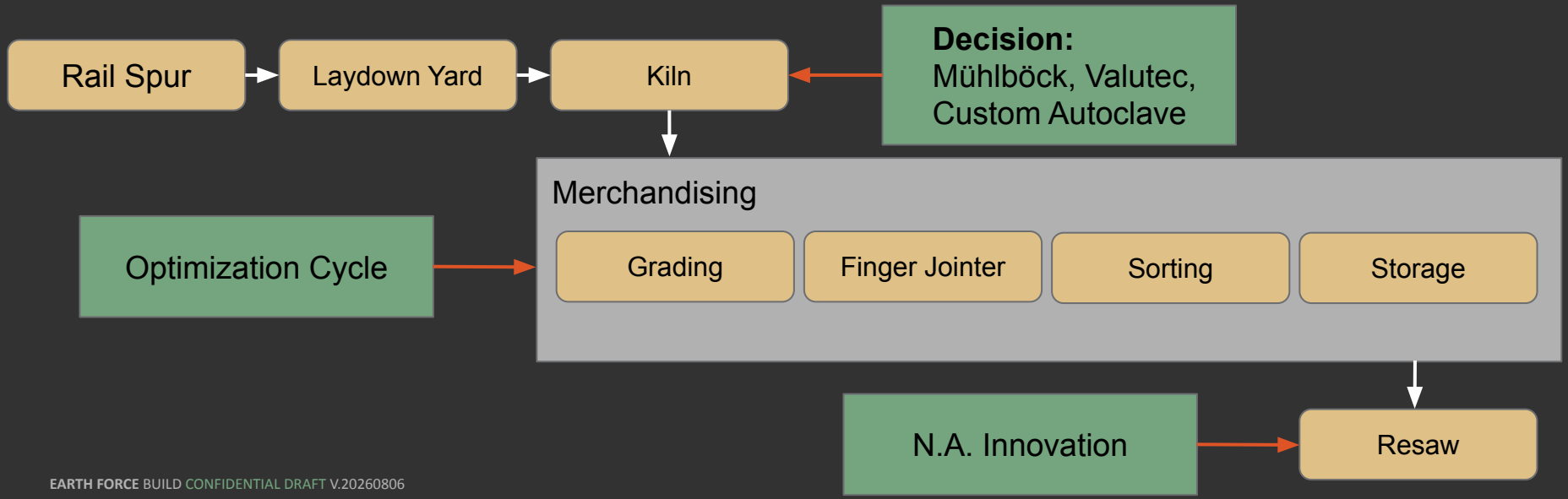
This is required for any CLT facility, we have to add it to Mercer and we'd have to build it into a new CLT facility if we went our own route.

The up-front control over materials yields less downstream waste and higher consistency materials (meaning more reliable tolerances and products). Every product, customer, and channel leverages this investment.

CLT 0.5 - Ingestion | Flow

Order of Operations

Most of this flow follows established European practices.



Thin CLT

Differentiated Capability, Strategic Advantage

$20M - Very Rough Estimate

- Spur & Receiving
- CLT 0.5 components (Kiln, grading, finger jointer, etc.)
- Resaw and Automation

ThinCLT is a North American Market advantage and we have a chance to get in early (2 others also entering, all starting in the last year).

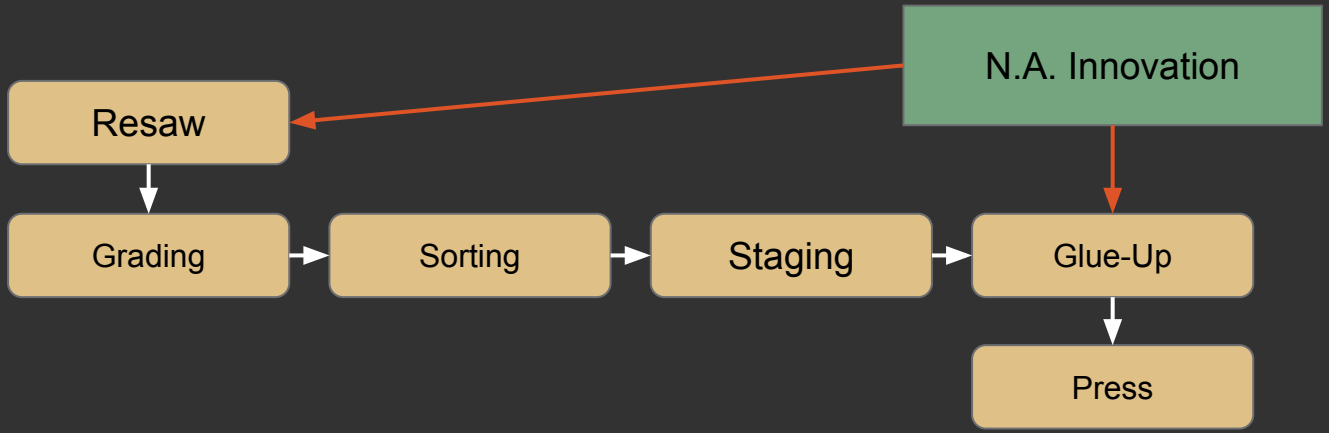
ThinCLT has nuance:

- **1st stage** ThinCLT is 20mm lamstock, meaning 60mm CLT (Everyone)
- **2nd stage** ThinCLT is 7mm lamstock, meaning 21mm CLT (Europe)
- **3rd stage** ThinCLT is heterogeneous lamstock, meaning mixed grade and thickness material is possible. (Europe)
- **4th stage** ThinCLT includes thermally modified materials (Us?)

Thin CLT | Flow

Order of Operations

Resawing allows us to use Flitch feedstocks



CLT 0.5 - Modularization

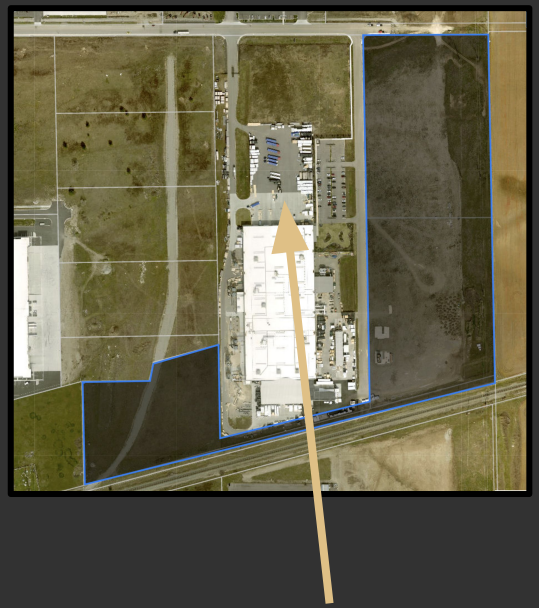
CNC and Finishing for converting CLT Billets into Build Modules

$10M

- Drum Sander
- Hundegger CNC
- Roof / light facility
- Gantry Cranes
- Conveyance

0-6: $3M Deposits
6-18: $7M Balance on Delivery
18+: OpEx

We could make due without this piece, at reduced throughput and difficulty with the Mercer facility operations.



Assembly 1

The first net-new Assembly Facility

$15M

- 0-6: Permitting and Money Down on Machines
  - $5M - Spread out across vendors (30% down)
- 6-18: Building
  - $8M - Process Cell Build-out and Machine due on Delivery, tail-loaded
- 18+: Operations
  - $2M - Process Cell Build-out, front-loaded

This represents our first scaled assembly facility. It will be built with our own ThinCLT system, but unlikely to be our own ThinCLT (machine delivery and facility stand-up will prevent in-house materials from being ready in time).

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Automation

Process development and maturation

Assembly 1 is predicated on the existence of certified process cells, these process cells incorporate appropriate automation. We need to know which process cells will go into the facility before we finalize and build that facility. Delay here delays out capacity build-out.

Automation locks in known quality, speed, precision, and reproducibility for a given process cell, it allows a process under development to graduate to our production line. Automation also orchestrates the inventory management linking the contracted work to the movement of materials to the production line.

1. The Resia Automation provides immediate access to automation appropriate for our process cell development.
2. The Resia Automation provides a significant discount (time and $) on commissioned automation
3. The Resia Automation provides a customer touch-point on established production capacity from our new facilities.

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Spend Order

When do we anticipate expenses to land

Draw Over Time

6mo: ~$65M (~~$40M with 30% down assumed everywhere~~)
12mo: ~$80M (~~$85M with 40% payment on progress assumed everywhere~~)
18mo: ~$120M (~~$130M with 30% on deliver assumed everywhere~~)
24mo: ~$160M (~~not priced, cost of production, cost of growth, Mercer's $90M CLT placeholder~~)
+ the floating $90M for CLT 1 / Mercer

OpEx:	6 | 12 | 24	$6M | $14M | $18M
COGs:	6 | 12 | 24	$200k | $500k | $1.3M (Guide only)
Build CapEx	6 | 12 | 24	$23-33M | $31-44M ($54-77M) | $23-33M ($73-110M)
Materials, Prototypes, etc.	6 | 12 | 24	$? | $? | $?

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Build Hiring Order

Build Staff

FTE
Daniel Todd - VP Operations / Process and Factory Development
Eva Talbot (Contract if necessary) - New Product Introduction
Bryan Dorsey (recently rejoined Boeing) - Design for Manufacturing
TBD - Contracts
TBD - Finance

Contract
Shauna Soboh - AEC Recruiting
John Dwyer - Market Development
Chris Olson - Product Architecture
Brent Olson - Product Engineer / Certification
Jack Cerenzia - Automation

Cross Cutting Scopes

Corp Product? Post-Sale Services Org within Build?

FTE

Jennie Steshenko - Data and Distributed Knowledgebase (Digital Backbone)
Meghan Purdy - GIS, Research, Analytics, and Carbon Provenance (Digital Backbone)
Claire Gagne - Microgrids and Smart Home Management (Built Services)

Discussion: Where does it fit?

Digital Backbone has the clearest cross-cutting requirement.
Built Services could be a subsidiary to Build, but aside from requirements isn't part of building.

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Build Research

Some certification support, some longer horizon moat development

Build Labs Advisory and Research

Wil Srubar (Boulder, CO) - Inorganic Materials Characterization
Karl Englund (Pullman, WA) - Composite Materials Characterization
Dan Dolan (Pullman, WA) - Assemblies and Systems Characterization
Maureen Puettmann (Corvallis, OR) - Lifecycle Assessment
Matt Pearlson (Wales, WI) - New Material Development

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Performance Milestones

Holding Progress to Account

>$100M
2028 revenue capacity target

$220–280M
invested over 2 years

~$75M
investment by month 6

6 months
to the equipment gate

EARTH FORCE

Process Cell Development

Core rules and maturity progression

Process Cell Maturity

V 0.0 Cells	Necessary placeholders - “Construction, indoors.”
V 0.1 Cells	Process Development Iterations - material improvements, graduating into production
V 1.0 Cells	Released Product Process Cells - producing components from the Build System catalog
V Next Cells	Further advantages in quality, safety, materials, margin to be unlocked in the future

Initial Prototypes will be produced via 0.0 Cells.
Cell development will prioritize cell-lift, the improvement expected for the next step-advance in process cell sophistication for each role.

0-6 Months:	Development of the spine, core cells necessary for the components in our main products
6-12 Months:	Ancillary cells required to complete pilot units
12-24 Months:	Deployment into Assembly 0, hardening and optimization of Nodes and Sites

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Maturity Milestones

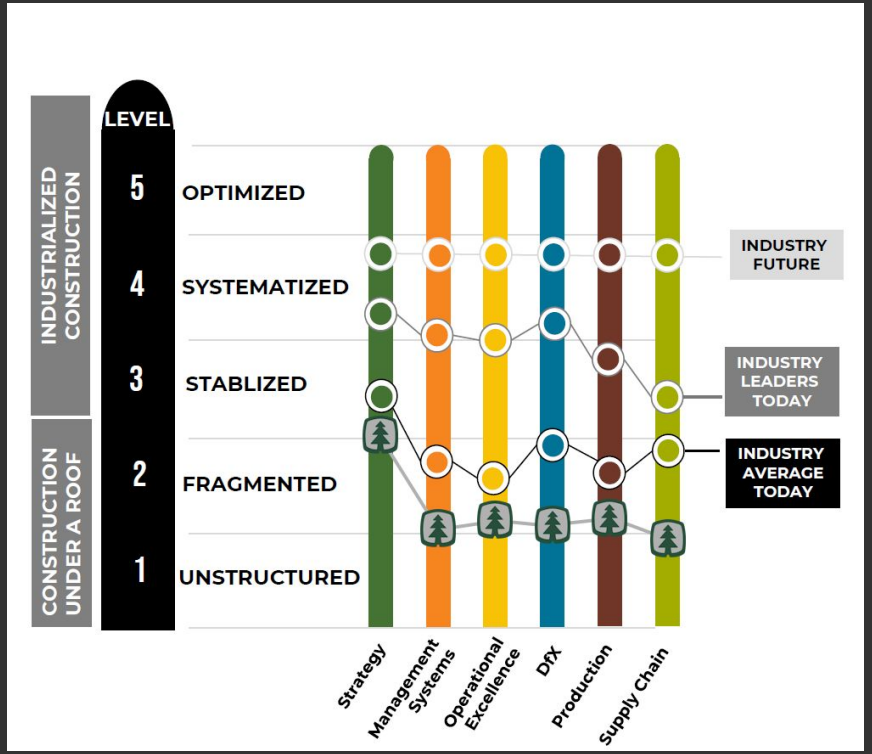
ICG Maturity Model (ICMA - Industrialized Construction Maturity Assessment)

We want to make the appropriate early investments, rather than just optimize for "line-go-up," so we need to pick out the *what* and *how* that really matters *now*.

And for reference, flat 4.0s would represent a Top US performer with 3,000 units/year output.

In time order:
Strategy > DfX > Management Systems > Production > Operational Excellence > Supply Chain

In margin impact:
DfX > Supply Chain > Operational Excellence > Strategy > Production > Management Systems



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FMEA - for Strategy

Let's use one of the tools, or at least the F^2 Analysis part

	Time Urgency	Impact on Margin	Priority
Strategy	1	4	5
Design For X	2	1	3
Management Systems	3	6	9
Production	4	5	9
Operational Excellence	5	3	8
Supply Chain	6	2	8

Establishing Strategy and beginning Design for X decomposition of our initial products are the clear early and continuing areas of investment, we should (and are) prioritizing work and hiring in these areas.

Management Systems and Production are necessary, but not critical success differentiators. Indeed we have close to a 4-way tie for 6th place, which means addressing by emergent need isn't a bad strategy.

Staffing Planning

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Strategy Milestones

Drill Down into Strategy Risks and Opportunities

We have well developed strategy for our stage, even with respect to the modular housing industry.

Top focus areas

Product Driven Sales	- Two areas: Pipeline/acquisition funnel (Justin) and Certification (Todd)
KPI Alignment	- Funding aligned to performance milestones (our work with VR)
IC-Aligned Roles	- Hiring Manufacturing (Dan), Market/NPI (Eva), and DfMA leadership (Bryan)

The team's focus and filling those open slots in the organization that are contributing to risk here suggests this element will swiftly develop.

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Design for X

Drill down on DfX risks and opportunities

DfX is one of our more primitive areas, we've designed a product platform but haven't tried to build it in a factory using process cells and nodes yet.

The top risk is in the name: Design for Manufacturing and Assembly, with the next most important being a Design for Supply Chain. Supply Chain naturally grows in importance when production volume saturates the local convenience supply of components.

We need to do what we've developed for CLT for all the other bits and bobs that go into a housing or industrial product.

We haven't devoted resources to this, we expect significant progress with additional resources.

Management Systems

Drill Down into Management Systems Risks and Opportunities

Top risk areas in Management Systems deal with Operating Standards, KPI Measurement & Analysis, and Workforce Capability Development. Some of this is simply due to not yet demonstrating an operating facility and some due to familiarity with the Spokane area workforce that already exists.

Workforce Development - Spokane is great, but we need to build the education and training engine for our process.

Establish New Product Introduction workflow, quality, productivity, and ramp-up metrics prior to building prototypes.

Following Design of product, definition of operating standards can commence and operating profile development can begin. This is a long-lead and will impact COGs, but we should be able to power through if necessary.

Production

Drill Down into Production Risks and Opportunities

There are two elements within the Production topic where Earth Force is already at standard (e.g. an industry leading approach), and one of them is the high risk Advanced Tooling & Methods domain.

We need to establish KPIs around maintaining our vision and discipline through the reality of production.

We need to persist in the plan for bringing refined process cells online in Assembly facility #1 as the best proof of future performance.

We need to avoid falling into the trap of chasing revenue by any means possible,

We are developing a process to transform construction and if we hold true to our beliefs we'll achieve it.

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Operational Excellence

Drill Down into Operational Excellence Risks and Opportunities

The areas of strength within Operational Excellence are around planning and systems, we're understandably light in the operations part of Operational Excellence.

The top risk is New Product Introduction, we intend to staff this mission with one of our first hires. The next two must emerge from the performance of our plan, Feedback Loops and Risk Management. We've spoken at length about these topics earlier in this deck (*even using a variation of FMEA in the prioritization of this list of topics - a recommended practice to deploy during automation development*), but it remains true that we have yet to stand up a production line and measure our own performance in the act.

We have confidence that the diligence we've shown to date will reflect in this area, when the time comes.

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Supply Chain

Drill Down into Supply Chain Risks and Opportunities

Supply chain does not identify many risks, naming selection of suppliers as a moderate risk and no other risks identified. Our supply chain thinking is well developed for CLT, which is sensible and reflects well our past. We must expand that approach to all aspects of the supply chain.

COVID exposed many US manufacturers who imported lean and JIT logistics and saw everything come crashing down when the pinch came. By contrast, Toyota had 18 months of production uninterrupted by supply chain constraints despite the chip shortage impacting modern cars. It wasn't because they were making dumb cars, it was because they took the whole lesson of Deming to heart and not just the balance sheet appealing bits about reducing static inventory in your value chains.

We are aware of such constraints and pitfalls, and intend to make entirely new mistakes with regard to supply chain rather than fall into the common failure modes of the industry and of manufacturing in North America.

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External Goals

Let's win a Deming Prize

Ok, yeah, let's put an assembly factory in Japan and win a Deming prize.

Like "1 Million Acres managed for wildfire risk that would not otherwise have been worked" for Guide, our big audacious goal needs to be a notable thing worthy of celebration. We'd like to land Toyota Home as a partner, let's demonstrate sufficient competence so as to stand as the senior partner.

Toyota (motorcars) won the Deming Prize in 1965, and again in 2016.
Toyota Home won the Deming Prize in 2018.
Looks like we'll have to win three.

Ya'all should read this, we are proposing a serious endeavor and that write-up begins to explain the scope of that aspiration.

EARTH FORCE BUILD

Process Spine

How components unlock products - Assembly Cells

>$100M
2028 revenue capacity target

$220–280M
invested over 2 years

~$75M
investment by month 6

6 months
to the equipment gate

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Elements of the Assembly Spine

We can bear a great weight if we keep our spine in a line

Carcass
MEP
Specialty Pods (e.g. Kitchens and Bathrooms)
Finishing

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Carcass Components

Every Product Starts with Structure

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MEP

Why we start with the Cloud Prototype

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Specialty Pods

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Finishing

Here be labor costs and rework

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Project Team

All the stakeholders involved in a Build Project

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Schweitzer Example

Full cycle team

First 4 Townhomes

- Developer (SPV with Schweitzer Mountain Team + Self Finance)
- GC (Synergy)
- Architecture (Olson - EF Contractor)
- Engineers
    - DCI (Subcontractor)
    - Mike Wright (Subcontractor)
    - MEP (Mckinstry - IP Questions in Electrical)
-

Knife River - Partnership

Channel Partner

Internal Product and Process Development - when ready we pitch to AT
- EF Engineers
- Knife River Engineering

Industrial Build System
- Project Architect (Drew Kleman)
- Project Engineer Structure and Fire (Holmes)
- Project Engineer MEP (McKinstry)

This team is the repeatable team for however many structures we build

Cloud - Design Integration

Full Cycle Team for our in-factory Prototypes

1. Prototypes
   Cloud has MEP and Structural engineering in-house
   They'll present to us
   We'll present back
   Prototype design and engineering will commence from that.
   This is a prototype in Factory 0, so the landed team won't be developed and deployed yet

2. TBD for future real projects

Unbrick - Example

Full cycle team

First 4 Townhomes

- Developer (CGC)
- GC (CGC)
- Architecture (Olson - EF Contractor)
- Engineers
    - DCI
    - Structure
    - MEP
-

EARTH FORCE BUILD

Process Cells

Process Cell Maturity - Not Just Robots

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EARTH FORCE

Process Cell Development

Process Cells are the building block of the Earth Force Build System

Code compliance leads to the checklist for Factory Certification

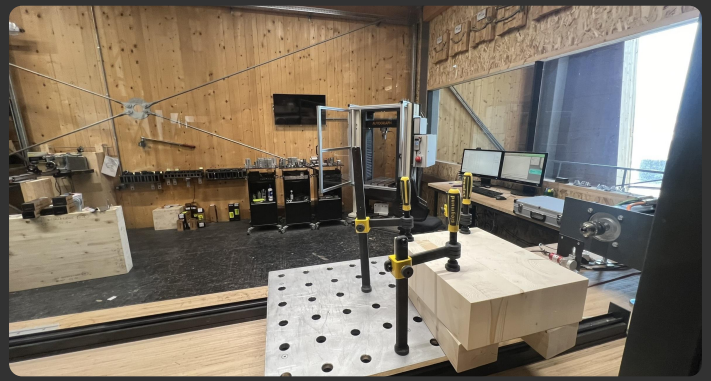
- Chain of Custody
- QA/QC Process
- Environmental Certs
- Product Certs
- Process Certs
- Code Reports

The Factory is comprised of Process Cells
We produce products comprised of parts from the catalog of known process cells

Work instructions, safety protocols, quality protocols

Manual Process Cells

Mostly people and hand-tools



Semi-Manual Process Cells

Jigs, power tools, conveyance

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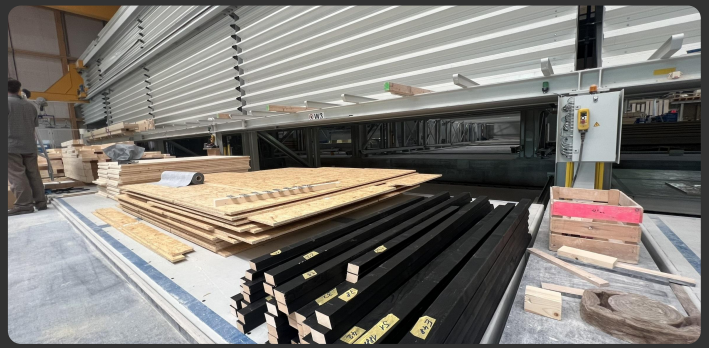
Semi-Automated Process Cells

Panelization, conveyance, lifting



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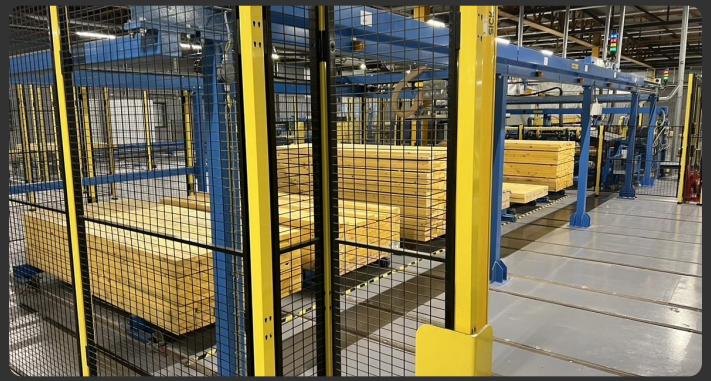
Automated Process Cells

Full lock-out cages and robotics



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Process Cell Development

Process cells have a range of rigor in their definitions

4 guys with hammers standing next to the work in progress directed to remain within that box painted on the floor represents a fast to develop and deploy process cell that requires low-investment inputs and outputs a wide and unpredictable range of outputs.

A roller conveyance with crowders holding a work in progress for two robotic arms to place and drive screws represents a slow to develop and deploy process cell that has a high input investment and outputs a narrow range of predictable outputs.

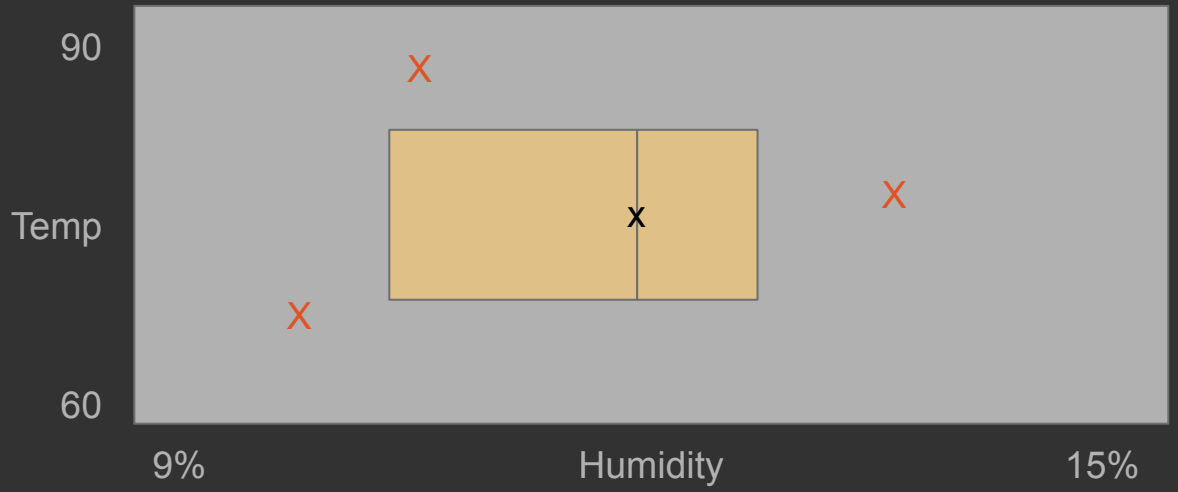
The manual process cell might be faster!
The heavily automated process cell might be rarely used!
Throughput is often an important objective of Process Cell Development, Not the only one.

The certification of these process cells represents development and commissioning within a factory, we don’t get to a repeatable Assembly facility without process cell development.

Process Cell Development

Need to understand the limits of the process

Knowing *one* set of conditions where “it worked” doesn’t establish the operating range where the process remains within control. Process Cell development establishes the bounds so we can build reliably.



EARTH FORCE BUILD

Build Lab

Developing Strategic Advantage

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EARTH FORCE

Materials and Certification Labs

Developing Strategic Advantage

1. Qualification of Process / Process Cell Catalog
2. Regulator Perception - code report generation
3. Employee onboarding, training, and education
4. Customer visualization, confidence, assurance
5. Develop Strategic Advantages
    a. Ponderosa Pine Utilization
    b. Waste Stream Optimization
    c. Resaw and adhesives innovations
    d. Low Voltage Electrical systems
6. Guaranteed Capacity
7. Fiber Security and depot optimization
8. Field Optimization and factory to forest feed-forward and feedback loops
9. Optimizing Logistics - routing the highest and best use for raw materials
10. Speed, cost, capabilities vs. 3rd party lab access